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DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

The South Wales Problem

A VERY serious state of affairs is revealed in the memorandum just issued by the South Wales Trade Recovery and Expansion Committee, reproduced on page 1076. One third of the insured persons, representing considerably more than that proportion of the total available workers in the "special areas" of South Wales, are unemployed, which means that these unfortunate people are in receipt of the "dole," or some other small income inadequate to raise them and their dependents above the level of that dire poverty the sight of which so shocked and distressed the Duke of Windsor on his recent visit as King Edward to South Wales. That is bad enough, but the remedy which the committee appears to have been driven by its frame of reference to suggest, is no less charged with gloom. "There can be no satisfactory solution" but the revival of the expert coal trade, and the committee quotes figures showing that shipments are now only about half what they averaged in the four years 1927-30. The memorandum recommends a Government subsidy as a weapon for the industry in its fight for foreign markets. At this time of dangerous struggle between industrial nations for markets to absorb their surplus output, it would seem appropriate to consider the question of subsidising the home consumer, who would thus at one stroke be raised out of poverty by being placed in a position to consume some of his own surplus output, and relieved of the fear that economic war might precipitate the nation into military war.

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The Need for Speed

"Please keep moving" is the exhortation displayed alongside escalators at certain London Underground stations, and an Irish newspaper has taken a gloomy view of this portent of still more hurry in the daily round. Superficially considered, such a notice to users of the modern accelerated moving stair may seem about as appropriate as shouting "don't block the gangway" (another well-known London Transport cry) to a man who is being swept down Niagara in a canoe. Yet there is, indeed, a need for speed, for the walls of escalator shafts seem to appeal increasingly to advertisers of accessories for the human form divine. As long as the only secrets imperilled were those of the opposite sex, little concern was felt, but today the scope of publicity has been extended to profane the darker mysteries of our own substructure. Any time now we are liable to be abashed as we escalate by pictorial reminders of the crude machinery designed for the suspension of the male sock or trouser—a betrayal of our confidence and a menace to our natural poise. We welcome, therefore, the "keep moving" edict, regarding it as a means of sparing the blushes which propriety demands of us.

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Congo-Ocean Railway Results

When the Congo-Ocean Railway was opened in 1934 it was expected that the operating revenue would not equal the operating expenditure for a year or two. Actually, in the first seven months the receipts totalled 7,700,000 fr. and the working expenditure only 6,250,000 fr. Traffic has grown since then, and for the full year 1935 the revenue totalled 17,000,000 fr. and the operating expenditure 12,000,000 fr., giving an operating ratio of 71, and leaving 5,000,000 fr. to help in paying financial charges on the 1,170 million fr. which the line cost to build. The number of passengers conveyed in 1935 was 30,000 and the goods tonnage 108,000. An appreciable portion of the goods traffic was formed of raw materials being transported from Central Africa for the construction of the new port at Pointe Noire, the Atlantic terminus of the line. The principal commodities conveyed are wood, copper, rubber, coffee and fruit. Economical working of passenger traffic has been possible since the opening by the use of 15 railcars, of which two Michelins make end to end runs between Pointe Noire and Brazzaville each day, covering the 319 miles in 11 hr. including all stops. In consequence of the wide use of railcars, the normal passenger stock is limited, but there are 5 first class and 3 second class *couchettes* used on night trains run in connection with boats. The locomotive stock comprises 3 oil-electric locomotives of 950 b.h.p.; 10 Golivé articulated locomotives; 6 Mikados; and 20 shunting and local traffic engines.

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Staff Welfare in Old Austria

In a very interesting article recently in the *Zeitung des Vereins*, Hofrat Dr. Feiler, of Vienna, gave some particulars of the staff welfare schemes of the railways of the former Austro-Hungarian Monarchy, showing that the justice, to say nothing of the expediency, of making adequate provision for the comfort and happiness of retired employees and members of the staff was early recognised by those lines; they were far ahead of many others in establishing welfare and benevolent funds on quite a liberal basis, making the railway service attractive and ensuring a contented and loyal body of servants. The Kaiser Ferdinands Nordbahn led the way soon after the

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opening of its Vienna-Brünn section, under the influence of its Chairman, Andreas von Baumgartner, later Austrian Minister of Commerce, who declared to the shareholders that it was their manifest duty to recognise faithful service in this way, and he brought forward a scheme worked out for him by the economist Salomon. This example was soon followed by the Vienna-Gloggnitz Railway, and even the historic Budweis horse line. With the coming of State lines the conditions of service were framed on civil service principles, and many of the private lines followed them in due course. Later the State lines were leased, but the arrangements existing were adhered to. They were modified and much improved in the course of time, being enlarged in scope, so that the conditions of the Austrian railway service became among the best to be found in Europe, doubtless contributing to that spirit of attachment and faithful performance of duty that more than once has been remarked on by observers.

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More Research in the U S.A.

We have made frequent references to the thoroughness with which research is conducted by railways in the United States, the most recent example being the intensive study of air-conditioning now in progress. During the present year, the activities of the Division of Equipment Research, Association of American Railroads, have reached a new high level. The association has provided funds for the continuation of experiments in measuring permanent way stresses under various conditions of service, and new instruments for adding to the data already gained in this direction are being developed. The most exhaustive tests ever undertaken to improve methods of rolling steel rails are now being conducted by the railways and manufacturers. These are to be extended to ascertain the practicability of hardening rail ends, an investigation that will continue at least another year. Rolling stock construction with light alloy steels is also the subject of research, particularly as to how lightweight freight vehicles stand up to the arduous conditions of modern service. Container design, standardisation of supplies, reclamation of old materials, and telegraph and radio communication are other directions in which the efficiency and economy of railway working are being furthered.

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Non-Stop Acceleration

Long-distance speeding up in the United States goes on unceasingly, and every fresh issue of the American timetables brings new evidence of a non-stop determination to improve the railway services. This winter, for example, 62 min. has been taken off the westbound schedule of the New York Central's South Western Limited, bringing St. Louis, 1,157 miles from New York, within 21 hr. 58 min. of the capital; the eastbound train takes 21¾ hr.; by way of competition, the Pennsylvania has accelerated the Spirit of St. Louis by 20 min. to take only 20 hr. 55 min. over its 1,047-mile route from New York to St. Louis. Between New York and Chicago the 20-hr. schedule that was for so many years the exclusive province of the Twentieth Century Limited and Broadway Limited expresses recedes further and further into the background; these two famous expresses remain on the 16½-hr. schedules introduced last summer, but each route now has other trains taking but little more. The westbound Pennsylvania Red Arrow (a new train), and the westbound New York Central Commodore Vanderbilt taking 17 hr. 10 min.; the eastbound Liberty Limited of the former and Water Level Limited (another new train) of the latter 17¼ hr.; and five other trains from 17 hr. 25 min. to 17 hr. 50 min. Most of the foregoing have been speeded up since the last timetables were issued. The Pennsylvania route, with its summit level of 2,194 ft. in the Allegheny mountains, is 903 miles in length, and the "water level" route of the New York Central is 958 to 961 miles, according to the course taken through the city of Cleveland. Important new long-distance services have been introduced by these two progressive companies, and acceleration in all directions is again the predominant feature of the new winter timetables.

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The Matriarch of Train Ferries

Although the sea-going train ferry belongs to the present century, even on the tideless Baltic, where the operation of such vessels presents no great difficulty, a train ferry was maintained for many years on the Firth of Forth between Granton and Burntisland, and this, we believe, was the first in the world. The *Leviathan*, as the vessel was called, first appears in *Lloyds Register* for 1874, but actually she had been in continuous service since 1849, in which year she was completed in the Clydeside yards of Robert Napier & Sons, who also supplied her engines. Until 1862, her owner was the Edinburgh, Perth & Dundee Railway, but in that year the E.P. & D. was absorbed by the North British Railway, which worked the train ferry service until the opening of the Forth Bridge made it redundant. After 1890, the old steamer, which must then have been worn out, passed into the hands of W. T. MacLellan, who sold her, in turn, to the Bank of Vera Cruz, Limited. This, however, does not mean that the *Leviathan* undertook a voyage to the Spanish Main in her old age; actually she was condemned for breaking up in July, 1892. The mother of all train ferries was a paddle steamer of 399 gross tons, registered at Granton. Her propelling machinery consisted of a 210 h.p. engine with two cylinders 56 in. by 42 in.; her length was 167 ft., breadth 34·6 ft. and depth 8·5 ft. The train deck was open, and only goods vehicles were carried. These were run from the shore tracks to those on the deck over a movable jetty, which was hauled up and down rails laid on an inclined plane, shelving towards the deep water beyond the railhead.

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Cab Signals on the New Haven Line

It is announced that the Interstate Commerce Commission has given the New York, New Haven & Hartford Railroad permission to dispense with automatic train control and substitute continuous four-aspect cab signalling between Springfield, New Haven, and Providence, on a total track mileage of 367. Cab signals will be provided on both the driver's and fireman's side of the locomotive, and a whistle will sound on any change to a more restrictive aspect, continuing until an acknowledgment handle is used. The general principles of working will be similar to those explained in the article in our issue of March 22, 1935, page 552. It is considered that this type of signalling gives such a high degree of security that automatic brake application in conjunction is not justified, in view of its expense in first cost and maintenance. The latter must be thorough if unnecessary brake applications, with consequent delay and risk, are to be avoided. The problem of automatic brake application with long, heavy trains running at various speeds, is, of course, somewhat different from that on electric rapid transit lines, where plain automatic stops of the trip pattern have proved themselves. As cab signals alone cannot stop a train if both driver and fireman are inattentive, there is still some risk of signals being unheeded, but if the maintenance of the equipment can be guaranteed so that the cab signals inspire confidence, then some American railway officers consider it so small that it may well be disregarded.

The Problem of Handling Manure Traffic

It is a little disconcerting for all concerned when bulk consignments sent by rail arrive at their destinations consistently weighing several hundredweight less than at the time of despatch. Such was the problem which recently confronted Southern Railway officials in connection with the handling of manure traffic between London and the Worthing fruit growing district. The railway company instigated an enquiry in conjunction with the contractors and the market gardeners of the Worthing district, and as a result it was established that there was no question of negligence on the part of the railway or consignors. It was found, in fact, that rapid evaporation was the cause of the loss, due to the release of carbon dioxide which amounted to about 2½ per cent. of the total load every twenty-four hours. Against this, of course, there can be no satisfactory protection. It has been found, for instance, that even if the traffic is conveyed by night, when the effects of the sun are avoided, the back draught set up by the passage of the train will be sufficient to reduce a single truck load by 2½ cwt. As a result, however, of careful research, described on page 1066 of this issue, the railway company has been able to find means of expediting the handling of the traffic so as to reduce delays to a minimum.

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Putting Electricity to Full Use

The use now being made by the Pennsylvania Railroad of its electrified lines is an object lesson as to what may be done in the speeding-up of a dense train service when electricity is available as the motive power. Over the 224·8 miles between New York and Washington, including slow running through the suburbs of New York, Philadelphia, Wilmington, and Baltimore, 34 daily trains between them average all but 55 m.p.h., none making fewer than five stops intermediately, and most of them stopping more frequently. The fastest—the Congressional—takes 3 hr. 35 min. Over the fast-running stretch between Wilmington and Baltimore 28 trains are booked at over 60 m.p.h. from start-to-stop, averaging between them 65·3 m.p.h., and with a quickest booking of one hour, at 68·4 m.p.h. Between Newark on the southern outskirts of New York, and North Philadelphia the important services to and from the Middle West are accommodated on the same metals, and here no fewer than 59 daily trains have an average running time of 71½ min. over the 75·7 miles, which gives an average speed for the entire series of 63·5 m.p.h. Two of these trains make the run between Newark and North Philadelphia in 64 min., at 70·9 m.p.h., twenty-two others have bookings ranging from 67·8 to 65 m.p.h., and none is scheduled at less than 60 m.p.h. inclusive; it is further a matter for remark that many of the expresses concerned are long-distance services which by reason of Pullman and sleeping car equipment are made up to very heavy formations. From New York to Philadelphia by Pennsylvania may well claim to be the busiest high-speed main line in the world.

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U.S.A. Locomotives and their Power

Ever since 1924 there have been steady reductions in the numbers of locomotives in service in the U.S.A., and the peak figure of 65,358 in 1924 had dropped to 46,594 in 1935. Of course the depression accounts for some of this drop, but many other and brighter factors have to be taken into consideration, such as the extensive replacement of old and obsolete engines with new units of greater power, and also the more intensive use of locomotive stock. So far as locomotive power is concerned, some interesting figures officially compiled show that the tractive effort of the average American steam locomotive has been raised from 33,188 lb. in 1916 to 39,891 lb. in 1924 and 48,367 lb. in 1935. Moreover, the figures for intermediate years show steady progression and demonstrate that increased power alone has almost compensated for the reduction in the totals of steam power units, apart altogether from the increasing use of diesel and electric traction. Thus the 1924 figures for Class I railways show a total of 2,593,178,015 lb. of steam tractive effort available, against 2,206,200,838 lb. in 1935. Incidentally, the increase in the average power figure of 1935 over that of 1916 is no less than 46 per cent.

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Railway Springs

An interesting article by Mr. R. W. Clyne on the causes of failures in railway springs appeared in the November issue of our American contemporary, the *Railway Mechanical Engineer*. At the outset the author remarked that the avoidance of spring failures is largely a technical problem, involving the practical application of the latest advances in metallurgy, physical testing, and design, as well as appreciation of the fact that "the cheapest spring is usually the most expensive one anyway." As the maximum stresses in railway helical carbon steel springs are frequently as high as 150,000 lb. per sq. in., while in alloy elliptics 160,000 lb. per sq. in. is not uncommon, potential sources of failure are numerous; they may originate in the rolling mill or in the original design of the springs, or else during manufacture or in service. Overheating of the steel during manufacture is one of the chief causes of reduced resistance to service conditions. Occasionally actual burning of the steel occurs, usually because of carelessness and poor workmanship during the heating operation prior to tapering. Also, spring design may be incorrect with respect to the spring itself, or to the space allotted to it in the structure of the locomotive or vehicle; or again the design may be unsuitable for the type of service. In the case of coil springs, design failures may frequently be traced to misunderstanding or ignorance of the effect of bar curvature in sharply coiled springs. The effect of sharp curvature and the stress condition may produce early failure in some types of service.

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Locomotive Crank-pin Failures

Another important matter discussed in the journal above referred to was the failure of locomotive crank-pins, which was dealt with by Mr. F. H. Williams, Assistant Test Engineer, Canadian National Railways. The author pointed out that many crank-pin failures occur in the wheel fit, and usually bewilder the uninitiated. For instance, the fractured end may show one half of coarse and the other half of fine texture, whereas the steel is actually uniform throughout. Then again one part of the fracture may appear very dark and rusty, whilst the balance is bright. The conclusion that the steel has a flaw covering the extent of the dark area is entirely wrong. Tests for the endurance limit of steels from which crank-pins and other parts are made show that in the case of ordinary carbon crank-pin steel the endurance limit runs about 40,000 lbs. per sq. in. or possibly a little lower, say 36,000 lb. per sq. in. It must not, however, be forgotten that the endurance test is made on a highly polished test specimen. Roughly speaking, a tool mark $\frac{1}{64}$ in. deep will cut the endurance limit to 50 per cent. of its proper value, or about 18,000 lb. and corrosion will cause similar results. In his summing up the author remarked that from a consideration of failures of crank-pins it might seem that with a proper finish of the wheel fit and fillets, the life of many crank-pins could be greatly prolonged.

Tourist Traffic from Overseas

THE close association of the British railway companies with the Travel and Industrial Development Association of Great Britain and Ireland makes it appropriate to refer to the recently published eighth annual report of the association's activities. This clearly indicates that "tourism" must now be ranked as an important industry seeing that, during the twelve months ended March 31, 1936, it is estimated that overseas visitors spent more than £26,000,000 in this country, a sum approximately equivalent to the value of the country's coal export or woollen export trade. The expenditure of this vast sum by overseas tourists directly or indirectly affects all sections of the community. The number of such visitors during the period under review showed an increase of 27,143 or 9 per cent. over the previous year and, while this may have been to some extent attributable to the Jubilee celebrations, it is interesting to find that the figures since March, 1936, show an even greater percentage increase over 1935. The principal objects of the association are the stimulation abroad of interest in Great Britain and Ireland in order to increase the number of visitors from overseas; to stimulate the demand for British goods and services; and to promote international understanding. The methods by which the association seeks to attain these objects are naturally somewhat diverse. Probably its most important effort is the preparation in four languages, and the circulation throughout the world, of a monthly periodical entitled *Coming Events* which, among many other interesting features, contains a three-months' diary of events of national importance, reinforced by paragraphs dealing with important events of outstanding interest to potential visitors.

Another monthly publication, *Industrial Britain*, is distributed to practically every country in the world, giving the latest possible information of industrial progress and developments in this country. The steadily expanding circulation of this booklet has led to an increasing number of enquiries as to the location of factories in Great Britain. Among other attractive publications are "The British Isles" (in two languages); "The London Handbook"; and the "Hotel Guide," with notes in six languages. During the year, also, thirteen folders were issued in co-operation with local authorities, printed in English, French and German, stressing the places of interest, &c., in particular localities, while during the present year it is hoped to issue a larger number covering most of the country. The demand for pictorial posters issued by the association continues to grow, while wireless talks prepared by English writers and dealing with almost every aspect of life in the British Isles are issued weekly to some 200 radio stations in Canada and the United States. By this means something like 7,000 talks were broadcast on the North American Continent during the year, and similar talks, suitably adapted, are issued in various other countries, including Egypt and Japan.

The participation in overseas exhibitions is also an important feature of the work, and, during the year, the association organised stands at the Lyons International Fair, the Canadian National Exhibition at Toronto, and, in association with the British railway companies, at the Brussels International Exhibition. As a result of the success of the joint exhibit at Brussels, a similar exhibit was arranged in connection with the Johannesburg Empire Exhibition which is now in progress. The close co-operation between the railways and the association is also evidenced by their joint participation in the information bureau on the R.M.S. *Queen Mary*, and the large number of railway travel publications which are circulated through the association. An extensive library of attractive photographs available for free reproduction is maintained, and one of the interesting developments of this work has been the increasing demand for photographs of this description for inclusion in school books, particularly in France. A number of films featuring travel have been prepared for loan to cinemas and private societies, while offices in New York, Paris, and in most European countries are actively engaged in disseminating travel and industrial literature with increasing success. It is impossible accurately to assess the extent and influence of the work which is being carried on by the association, but its cumulative effect is undoubtedly contributing materially to the increased prosperity of the country, and its activities deserve encouragement.

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Centenary of the Morse Telegraph

THE present year marks the centenary of the public exhibition in New York of the first form of the Morse telegraph which, modified in some important details, subsequently spread to all parts of the world. Eight years elapsed before the first line was opened for public service but the essential features of the Morse system were in existence in 1836. Although other systems of telegraphy have now replaced it to a great extent, the so-called Morse code of signs, composed of short and long elements, is used on sea and land for visual and audible signalling by flash-lamp, hand flag, and whistle, making Morse's name familiar to many who have nothing to do with electric telegraphy. The initial success of the Morse apparatus was due no doubt to the simplicity of the leading idea, which enabled a recording telegraph to be made with the minimum of complication; and when it was discovered that the mechanism enabled messages to be received by sound at a considerable speed, with the acquirement of a little skill, a further impetus was given to its adoption. Unlike many pioneer workers Morse lived to see his invention widely adopted and to reap substantial benefit therefrom. Samuel Finley Breese Morse was born at Charlestown, Massachusetts, in April, 1791, the son of a clergyman, and was descended through his mother from another one, Samuel Finley, once President of Princeton College. Graduating at Yale in 1810, Morse, who had strong artistic leanings, went to Europe in the following year under the guidance of Washington Allston, the eminent artist of South Carolina, with introductions to Benjamin West, an American artist settled in London (who became President of the Royal Academy in 1792 and held that office for many years), and to John Copley, another American artist then living in England. West held Morse's artistic talents in high regard, and apparently with justification, for in 1813 a picture by Morse was exhibited at the Academy and he also received a gold medal from the Society of Arts for other work. Returning to America, Morse made little financial success with painting until he took to portrait work, when he began to prosper and obtained a good connection in the Southern States. He became President of the Academy of Design and in 1827 began lecturing to the New York Athenæum. Family misfortunes again brought difficult circumstances, but he went to Europe in 1829 to study art, and returned in 1832.

When at Yale, Morse had learnt all that was then known of electrical phenomena from the lectures of Benjamin Silliman the elder, a noted geologist and mineralogist, with whom he maintained friendly relations and thus heard of progress in that field from time to time. In 1827 he heard some lectures on electro-magnetism by J. F. Dana in New York, the electro-magnet having been discovered by Sturgeon in 1825. On the voyage home from Havre

in 1832 in the packet ship *Sully*, electrical discoveries were being discussed when Morse, who had not heard of an electric telegraph, evolved the idea of using an electro-magnet to imprint conventional signs at a distance, as Steinheil of Munich did independently about the same time. Morse proceeded to sketch out a model apparatus and compose a telegraphic dictionary, his idea being to signal groups of numbers, to be decoded from a code book, as was usual with the visual telegraph systems then in vogue. In 1833 he made his first model, which made V-shaped marks representing numbers, not the dot and dash signs afterwards introduced. The transmission was effected by setting up the message in special type in a holder; this was then moved beneath a circuit closer, so sending the corresponding impulses to the receiver. A private exhibition in 1835 at New York University was followed by a public one in 1836, and in 1837 Morse became associated with George and Alfred Vail, iron and brass workers in New Jersey. The last named is credited by some with having drawn up the original Morse alphabet of dots and dashes (still used we believe in the United States and Canada) known today as the American Morse code, in which some so-called spaced signs are used. These are somewhat more liable to mistransmission than those employed in the International Morse code used elsewhere. The latter is said to have been proposed by Gerke, inspector of the first German Morse line from Hamburg to Cuxhaven, opened in 1848. Slightly varying codes were used in Europe for a time but on July 1, 1852, the States of the Austro-German Telegraph Union adopted Gerke's code and the International Union adhered to it in 1865, and this is the Morse alphabet as understood in England today. Although the needle telegraph was largely used here, this alphabet was then adapted to it, left and right beats of the needle corresponding to a dot and dash respectively.

In 1837 Morse showed an improved model apparatus at the Franklin Institute, Philadelphia, and approached the U.S.A. Government with it, but nothing resulted. Morse then applied to Congress for aid in constructing an experimental line from Washington to Baltimore, a distance of 40 miles, and the project was referred to the Committee on Commerce, presided over by Francis Smith of Maine, afterwards a close associate of Morse. The report was favourable and said, among other things, " it is obvious that the influence of this invention over the political, commercial and social relations of the people of this widely extended country, looking to nothing beyond, will in the event of success, of itself amount to a revolution unsurpassed in moral grandeur by any discovery that has been made in the arts and sciences, from the most distant period to which authentic history extends to the present day. . . . . Space will be, to all practical purposes of information, completely annihilated between the States of the Union, as also between the individual citizens thereof." A grant of $30,000 was recommended but, in spite of this eulogistic language, Congress did not yet approve the plan and sanction was not given until March 3, 1843. Meanwhile Morse and Smith visited Europe, but without much success. A patent was refused in England because the nature of the invention had been already disclosed. Construction of the Washington—Baltimore line was pushed forward at once. Underground construction was at first attempted and nine miles thus laid, but it proved a total failure and a pole line had to be installed. Metallic circuit was adopted, as Morse had not heard of Steinheil's discovery of the earth return. On May 27, 1844, the opening dispatch was sent from Washington by a lady, Miss Annie Ellsworth, and the first words transmitted were " What hath God wrought?"

Morse, of course, could then know little of the properties of electric circuits and imagined that the wire on the electro-magnets had to be as stout as the line wire; they consequently had coils eighteen inches diameter, weighing a hundredweight and a half! Before many years had passed numerous detailed improvements were made, the ink writer and sounder assuming substantially the forms in which we still know them. The telegraph spread rapidly in America; in 1852, for example, there were reported to be 12,124 miles of Morse circuits, leaving some 2,800 miles worked on other systems, chiefly the electro-chemical telegraph of Bain and the remarkable printing telegraph, now practically forgotten, of Royal E. House, forerunner of the Hughes apparatus. There were by then eleven telegraph companies with offices in New York. Morse came to Europe again in 1845 and made the acquaintance of Daguerre; on his return he interested himself for a time in the daguerrotype process, but the extension of his telegraph soon claimed all his attention. It brought him many foreign distinctions, and at a meeting in 1858 of representatives of France, Russia, Austria, Sweden, the Papal States, Turkey, Sardinia, Holland, and Belgium, he was voted an honorarium of about £16,000 as consideration for the use of his instruments by those countries; a commercial assessment would, of course, have given him millions. On Morse's 80th birthday in April, 1871, a great ceremony was held in New York, when his monument was unveiled in Central Park. In the presence of many distinguished visitors the following message, drawn up by him, was transmitted to almost all American receiving stations and many overseas. " Greetings and thanks to the telegraph fraternity throughout the world. Glory to God in the Highest. On Earth Peace, Goodwill to Men." Morse then took the telegraph key and sent his own name. To this message replies were received from a great number of places. Morse died on April 2, 1872, in New York, leaving a name which is, for a number of reasons, better remembered perhaps than any other in the history of telegraphy, although many other inventors in that art have displayed more originality and ingenuity than he. The great merit of the Morse telegraph, fully justifying the extensive use made of it, was its inherent simplicity.

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Elimination of Level Crossings in North America

ALMOST every railway in the world is at present taking steps to eliminate level crossings, but there are few where the need for such action is more pressing than those of North America. Two schemes with this end in view that have recently been brought to a successful conclusion on that continent, are at Syracuse (U.S.A.), and London (Canada). Until just recently over 100 trains passed through the middle of Syracuse at street level daily, transcontinental and other expresses traversing the whole length of Washington Street, a distance of well over a mile, as depicted in one of our illustrations on page 1070. This and other streets crossed or traversed were occupied by the New York Central & West Shore main line tracks under perpetual franchises granted 99 years ago.

The problem of the removal of these tracks from the streets was first studied seriously in 1899, when the city authorities requested the New York Central administration to prepare plans for an elevated line along the West Shore Railroad right of way. In that year also the Syracuse Grade Crossing Commission came into being, but it was not until 1912 that it was authorised by the State legislature to take steps to eliminate the tracks and level crossings. Years of planning followed until, in 1925, the State Referendum approved a $300,000,000 bond issue to

finance the scheme. The next four years were occupied in obtaining the approval of various authorities to a detailed plan, after amendment to satisfy objections raised at public hearings, and it was in October, 1929, only, that the commission issued a general order for the elimination according to the finally-approved plans, and directed the New York Central Railroad Company to proceed with the work; this is briefly described on pages 1060-1.

In Canada, too, much the same kind of thing has been done at London, Ontario. An agreement concluded in 1930 between the Canadian National Railways and the City of London paved the way for the elimination of many level crossings and the construction of a fine new station. Its opening ceremony was performed by Sir Percy Vincent, Lord Mayor of London, England, and one of the new C.N.R. streamlined passenger locomotives was on view during this function.

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The Heaviest Locomotive

IT is not unnatural that frequent discussion should take place as to what is the biggest locomotive, but size, being a matter of cubical contents, is not a very good guide, and power, being a very nebulous term, merely provokes further argument. Thus it is that such discussions usually boil down to which is the heaviest locomotive. Records for weight, as might be expected, go to America, for the U.S.A. can boast of the heaviest articulated, non-articulated, tank, and electric locomotives in the world. The heaviest locomotives in the world are the 12 Yellowstone 2-8-8-4 Mallets of the Northern Pacific Railroad, which scale 499 long tons (of 2,240 lb.) with tenders. Second on the list are the new high-speed 2-6-6-4 Mallets of the Norfolk & Western Railroad, which weigh 424 long tons with tender, but the locomotive weight of 254 tons is exceeded by the 2-10-10-2 Mallets of the Virginian Railroad, and the 4-8-8-2 cab-at-front oil-burning Mallets of the Southern Pacific. The Virginian locomotives weigh 305 tons alone and 402 tons including tender, and the Southern Pacific engine plus tender total is 405 tons.

In the non-articulated class the 88 engines of the 4-12-2 type belonging to the Union Pacific rank as the heaviest, the engine weight being 221·8 long tons, and the engine plus tender total 350 tons. This is approached fairly closely by the U.S.S.R. 4-14-4 engines, which weigh 205 tons alone and 328 tons with tender. The heaviest non-articulated tender engine in Europe (excluding the U.S.S.R.) is the Belgian National 2-8-2 passenger engine of Type 5, which weighs 128 tons alone and 210 tons with a full tender. This is followed by the 124 tons of the P.L.M. Mountain No. 241.C.1 (the only one of its class), which weighs 185 tons with tender; the 124 tons of the Belgian National Pacifics of Type 1, weighing with tender 204 tons; the 123 tons of the French State Railways' 3-cylinder Mountain, No. 241.101, scaling with tender 199 tons; and the 120 tons of the P.L.M. 2-10-2 compound goods engines, weighing 182 tons with tender. The heaviest tender engine in Britain is the L.N.E.R. 2-8-2 *Cock o' the North*, 110 tons, engine, and 166 tons with tender, the last figure being almost equalled by the same company's streamlined Pacifics, with a total of 165 tons.

Among tank engines the palm is held by the 4-6-6 class of the Boston & Albany Railroad, with a weight of 158 long tons, and these are followed by the Bulgarian 2-12-4 " centipedes " weighing 147 tons, and the 4-6-4 tanks of the Central Railroad of New Jersey at 131 tons. Then come in rapid succession the latest 2-10-2 tanks of the Reichsbahn (125 tons); the 4-8-4 tanks of the Netherlands Railways (124 tons); the two-cylinder compound 4-8-4 suburban tanks of the Central Argentine Railway (123 tons); the 4-6-4 passenger tanks of the German State Railway at 122 tons; and the Buenos Ayres & Pacific 4-6-4 and Nord 2-8-2 tanks, each 120 tons. The heaviest British tank engines are the booster-fitted 0-8-4 class of the L.N.E.R., weighing 104 tons. They are the only British tanks to exceed 100 tons, the next on the list being the L.M.S.R. (ex-L. & Y.) four-cylinder 4-6-4 engines at 100 tons. The heaviest Garratt is the 4-8-2 + 2-8-4 engine in the U.S.S.R., which weighs 255 tons with a complement of fuel and water. With a weight of 573 long tons the Virginian triple-unit 3 (1BB1) machines are by far the heaviest electric locomotives in the world, and the heaviest diesel locomotive, the twin-unit 2-Do-1 + 1-Do-2 set of 2,400 b.h.p. on the U.S.S.R., with a weight of 254 tons, is also well ahead of its nearest rival, which is the Atchison, Topeka & Sante Fe 3,600 b.h.p. locomotive weighing 215 tons. All the weights given above are taken to the nearest ton.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

London to Inverness

Northwood, Middlesex
December 15

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—The recent improved timing of the experimental train between Euston and Glasgow has raised the question of a quicker service to Inverness.

In 1895 the night express from Euston was drastically speeded up both by cutting down the time spent at stations as well as by faster running, with the result that in the winter of that year Inverness was reached 40 minutes quicker than now, although the distance was some 26 miles more since the direct line north of Perth from Aviemore was not constructed. The timing of the Scotch Express, as it was called, which left Euston at 8 p.m., may be compared with that of The Royal Highlander which leaves at 7.30 p.m. today, for as far as Perth the route is the same:—

(Winter service)		1895	1936
Euston	dep.	8.0 p.m.	7.30 p.m.
Carlisle	arr.	2.10 a.m.	2.5 a.m.
,, ...	dep.	2.15 a.m.	2.20 a.m.
Perth	arr.	5.15 a.m.	5.33 a.m.

In 1895 and 1936 there are seven booked stops (one being " if required " in 1895). In 1895 only 24 minutes were spent at the stations as against 53 minutes today, but even so the running time of 1895 was 19 minutes better than today to Perth.

The Inverness connection left Perth at 5.30 a.m. and reached Inverness via Forres at 9.40 a.m., but today the train does not leave Perth until 6.25 a.m. and is due at Inverness by the direct line from Aviemore at 9.50 a.m.

Your obedient servant,

REGINALD B. FELLOWS

IRISH REUNION DINNER.—The third annual reunion dinner of the chief officers of the railway and shipping companies in Ireland was held at the Royal Hibernian Hotel, Dublin, on Thursday, December 10. The chair was occupied by Mr. J. Whyte, Manager of the Londonderry & Lough Swilly Railway, and Chairman of the Irish Railway Clearing House Managers' Conference. The toast of " Past Officers " having been proposed by the Chairman, Mr. J. Ingram suitably replied. A cordial vote of thanks was passed to Mr. W. E. Richardson for his performing the duties of Honorary Secretary. The attendance included :—

Messrs. C. Baillie-Gage, D. Barry, E. C. Bredin, J. Doyle, P. J. Floyd, C. F. Hornsby, G. B. Howden, J. W. Hutton, J. Ingram, J. M. Irwin, F. E. Jones, H. R. McIntosh, J. P. Meadows, R. W. Meredith, W. F. Minnis, W. H. Morton, G. J. Murphy, D. Narramore, E. A. Neale, J. H. Nicholson, H. Phillips, W. E. Richardson, C. E. Riley, G. E. Shanahan, Hartnell Smith, J. B. Stephens, R. Stewart, F. C. Wallace, J. Whyte, G. H. Wild, and J. Young.

PUBLICATIONS RECEIVED

The Chinese Railways : A historical survey of the development of railway construction. By Cheng Lin (H. Lin Cheng). Shanghai : China United Press. 10 in. × 7 in. 214 pp. with maps. Price $6·00.—This remarkably well written and produced volume constitutes a very readable history and record of the railways of China. The preface is devoted mainly to showing how very greatly Chinese and Manchurian politics have been governed by railway concessions and agreements, and puts the Chinese case with regard to the Chinese Eastern Railway very clearly. The Boxer Rebellion of 1900 and the Revolution of 1911 are attributed mainly to railway policy. As a Counsellor in the Chinese Ministry of Railways, the author had exceptional facilities for tracing records for the compilation of this history of the railways. Its frontispiece is a small-scale but clear map showing the complete system and proposed lines, and there is also a folding map with a scale of about 200 miles to an inch with this volume, showing railways, highways and airways in China, Manchukuo and parts of adjacent countries ; both are most useful.

The history opens by recording the strongly opposed construction of the first line on Chinese soil, from Shanghai to Woosung, and the subterfuges of the British and American promoters of the scheme to counter this opposition. The line was opened in 1876, but the Chinese Government, in deference to continued public appeal against it, bought it up and had it dismantled a year later. The present Woosung line was not built until 1897.

Coal mining, sponsored by Chinese as well as British interests, soon forced the hands of the Government, however, and made rail transport a necessity, the Tangshan-Hsukochwang Railway being opened to carry coal in November, 1880. Animal power, at first insisted upon by the authorities, had to be abandoned almost at once, and on June 9, 1881, a locomotive capable of hauling 100 tons and built locally by Mr. C. W. Kinder, the engineer of the line, at a cost of $520, was placed in service and formally named *Rocket of China*, as that date commemorated the centenary of Stephenson's birth, not "the 100th anniversary of the building of the original *Rocket*," as stated by the author. Since May, 1881, trams have been running on this line, which soon became the thin end of the wedge of railway promotion and expansion in China. A chronological table is then given showing the construction works of all lines in that country (including Manchukuo, in so far as the Chinese were interested) down to 1934. Chapter 3 is devoted to "The Scramble for Concessions," Chapter 4 to railway loans, grouped both by years and by countries.

Chapters are also devoted to brief histories and descriptions of the various lines, the Government railways administration, miscellaneous railway problems, and the future of Chinese railways. Manchurian railways and problems (including the C.E.R.), documentary data, and a bibliography, form the subjects of some of the appendices. The whole work is full of valuable information and should be of considerable interest to students of railways throughout the world ; it certainly was to us.

Chart Aids to Management. By M. L. Yates. Manchester : Emmott & Co. Ltd., 31, King Street West ; London : 28, Bedford Street, Strand, W.C.2. 7½ in. × 4¾ in. 51 pp. Illustrated. Paper covers. Price 1s. 6d. net.—This pamphlet sets out to be of service to factory executives who wish to develop the use of effective charting without the necessity of extensive reading on the subject, and to all students of business organisation and management. The author deals with all types of graphs, ranging from simple circular charts, cut into segments to show relative proportions of a whole, to advanced nomograms which enable all equations of a given type to be solved by means of one diagram and the value of complicated expressions to be found graphically. Organisation charts also come within the scope of the author's survey. Examples of all these various types are generously distributed throughout the text. The author pays particular attention to the art of preparing a graph or chart, so that it may best fulfil its function, whether it be to attract attention or convey a fact at a glance or to provide office executives with a conveniently condensed statement of the relation between, say, sales and production. This monograph is concluded with the suggestion that, "Factory executives possessing a knowledge of the various types of charts and recognising the divers uses to which these may be put in summarising information, providing records, exhibiting relationships, facilitating calculations, and effecting control should find ample opportunity in the course of their work for experimenting to advantage in this attractive subject." At any rate, this short exposition by Mr. Yates has its fascinations.

The Railway Stockholder. Issued by the British Railway Stockholders Union Limited, 25, Victoria Street, S.W.1. 9½ in. × 7 in. 20 pp. Illustrated. Price 2d. monthly.—With its December issue, *The Railowner*, organ of the British Railway Stockholders Union, has changed its title to *The Railway Stockholder*, and appears between new and distinctive covers. Since February of this year, its size has had to be increased to 20 pages, and throughout its life (it first appeared in December, 1934) the journal has steadily widened the scope of its interests. A message from Sir Josiah Stamp is quoted in the editorial of the issue before us, reading "I am glad to hear that *The Railowner* continues to widen its influence, and I wish the journal under its new title the greatest prosperity in the future in its policy of promoting an intelligent interest in railway affairs." The varied contents and interesting correspondence in the first issue leave no doubt that the journal will perform a most useful service in that direction. The railway industry is surveyed not only from a financial standpoint, but with the desire to interpret to the stockholder the significance of those developments in speed, equipment, and policy that are liable to receive somewhat superficial treatment in the daily press. There is an article on the L.M.S.R. six-hour Euston-Glasgow runs, and the editorial in THE RAILWAY GAZETTE of October 23 on "Should Railway Companies Build Locomotives ?" is reproduced. Both as a vehicle for topical information of this kind, and as a readable and well-produced record worthy of the society's growing membership and increasing activities, *The Railway Stockholder* deserves a successful career.

Conductor Through the M.A.N. Permanent Exhibition, Oberhausen/Rhineland.—We have received a copy of an illustrated book with this as its title. In addition to forming a guide through the permanent exhibition of the Maschinenfabrik Augsburg Nürnberg A.G. located within the exhibition buildings of the Gutehoffnungshütte at Oberhausen, Rhineland, the volume represents a compendum of the complete range of M.A.N. activities and its development and organisation, a map being reproduced showing the location of the respective works at Augsburg, Nuremberg and Gustavsburg. There are portraits of the founders of the concern which dates back to 1840 when the number of workmen employed was 44. This number now runs into many thousands and it was in 1898 that the Augsburg works were merged with those belonging to the Maschinenbau Nürnberg A.G., the title M.A.N. being adopted in the year 1909, whilst in 1920 the concern was merged with the Gutehoffnungshütte of Oberhausen. The capital and reserves of the Maschinenfabrik Augsburg-Nürnberg A.G., at present amount to 22 million Reichsmark.

The main portion of the volume is devoted to illustrated descriptions of the manufactures of the M.A.N., and it is here stated that the diesel engines built up to the beginning of 1936 represent, in the aggregate, about 3,500,000 h.p., in addition to 1,200,000 h.p. represented by gas engines and blowers. All the activities of the concern in the numerous industrial fields catered for are set forth in some detail in this illustrated volume. This is an interesting and well-illustrated booklet, and serves to impress upon the reader the wide scope and ramifications of the M.A.N. concern. The edition before us is in English.

XUM

THE SCRAP HEAP

LORD GREY AS N.E.R. CHAIRMAN

Ever since 1898 he had been a director of the North-Eastern Railway, with a modest salary of £300—not enough to save him from the dire need of letting Fallodon during the summer months of 1902-5, for he was never a rich man. The work was congenial, and so was the company of his brother directors, men like Sir Matthew Ridley and Sir Hugh Bell. Twice a month they met at York, dining pleasantly together overnight and transacting their business next morning. The Station Hotel, York, which he liked, played a large part in his life.

In 1904 he was chosen chairman, on Ridley's death, with more work and a salary of £2,000 a year, which would have enabled him to live exactly as he wished. "I am in for what may be my life's job," he wrote to Dorothy.

> The year 1905 was one of the happiest of my life; the work of Chairman of the Railway was agreeable and interesting, but it left in those days plenty of leisure. There were many days spent at home, in the Itchen valley or in Scotland. If only I could be free from politics, there was a prospect of permanent and interesting work, with income sufficient for all we needed, and a more constant home and country life than we had yet enjoyed. Life, which had been very pleasant since 1895, promised to become more pleasant still. It was not to be. ("Twenty-five Years," chap. iv.)

In a letter to a friend connected with another railway line he describes one aspect of the N.E.R. policy:—

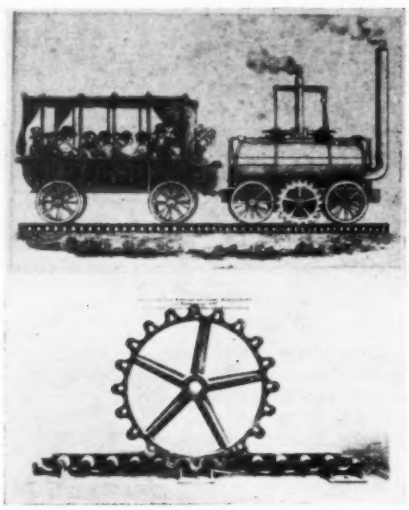
> I think your directors are wrong in not recognising the Union to the extent of letting the men be represented by the man or men of their choice. The N.E.R. always met the officials of the Union. No doubt the Union kept putting forward demands on the N.E.R., but the Union was strong, and did what other Unions do, and the trouble would have been worse between directors and men if the N.E.R. had not recognised the Union. I suppose the other lines think they can smash the Union or prevent its being formed in their systems, but I believe that Unions will form anyhow and that in the long run you can deal better with organised than unorganised labour.

Grey retired from the chairmanship and from the board of the railway when he became Foreign Secretary in December, 1905, and was re-elected to the board in January, 1917, the moment he recovered his freedom. [After the amalgamation he became a director of the London & North Eastern.] The railway indeed was no inconsiderable part of his life and of his connection with his northern neighbours of all classes, many of whom came to feel for him, as years went by, the deepest reverence and affection.—*From "Grey of Fallodon" by Professor G. M. Trevelyan, O.M., now appearing in "The Sunday Times."*

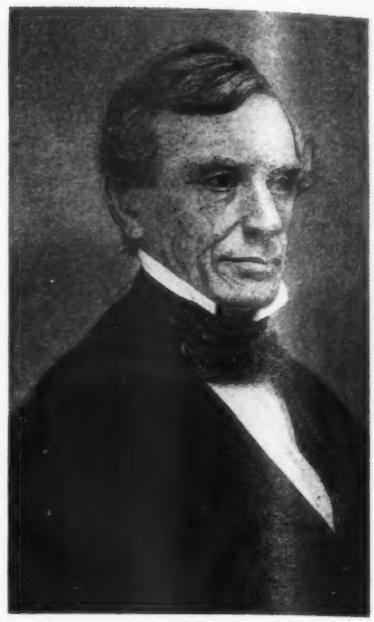
On Christmas Day a large number of Highland labourers engaged in the neighbourhood of Stonehaven on the Aberdeen railway, entered the town of Stonehaven armed with pick-handles and weapons of a similar kind, and commenced an immediate attack upon the inhabitants. A number of persons were very much injured. One young man was killed in the street, and two others received injuries which are likely to prove fatal. The windows of many houses were destroyed. In one or two cases houses were broken open—their inmates beaten and their furniture broken. On the following day a company of soldiers from Aberdeen entered the town in post-chaises. In the evening of that day the shops were closed. Previous to the arrival of the military, nine of the rioters had been apprehended by the civil force.—*From the "Scottish Guardian" of January 11, 1848.*

* * *

The thanks of *Vice-Roy*, a much travelled Scotch terrier, and his master, Colonel David Ritchie, Chief Constable of Calgary, have been tendered to the Express Department of the Canadian National Railways for arranging a very comfortable journey across Canada for *Vice-Roy*. In a letter to the department Colonel Ritchie stated that the dog, which had been imported from Glasgow, arrived in first class condition and "came out of the box full of ginger." A few days after his arrival, *Vice-Roy* was placed in the Calgary dog show and won the ribbon for the best terrier in the show. Special arrangements are made by the Canadian National Express for taking care of dogs and other animals in transit. At every point where a stop is made for coal or water, or for the changing of engines, the express clerk in charge of the car puts a dog on a leash and exercises him. His crate or box is cleaned out regularly and food and water supplied. The Canadian National Express in the past few years has won a reputation among dog breeders for its success in providing travel for their pets.



Scarce view (reproduced from a recent special number of "Elektrische Bahnen") of the Middleton colliery railway with Blenkinsop rack rail and Murray locomotive. Steam traction was introduced on this line in 1812, but so far as we can trace, passengers were never carried



A picture, taken about 1850, of Samuel Finley Breese Morse (1791-1872) whose work forms the subject of an editorial article on page 1054

* * *

Two travellers were seated in a railway carriage. As soon as the train started one got up and opened the window. After a few minutes the other shut it. The first man immediately rose and opened it again. "What are you playing at?" demanded the other. "Draughts," said his companion, "Your move."

* * *

I have a warning to all families who own a small boy interested in trains, and it is this: Make sure that his clothes are firmly attached to his person before he goes out. I heard yesterday of a case in Bradford where this precaution was neglected. The small boy in question was in the habit of studying trains from an "openwork" iron bridge near his home. One day recently he arrived home minus his trousers. His horrified parents, making inquiries, were told that he had dropped them on to a passing train in fulfilment of an urge to see them travelling away by themselves. I understand he was highly satisfied with his experiment.—*The "Yorkshire Post."*

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

UNITED STATES

Traffics Continue at High Levels

Railway traffics are continuing at excellent levels. The seasonal peak of freight traffic was passed in the week ended October 17, when cars loaded exceeded 826,000, but the decline which has occurred since that time is not as great as might have been expected, and loadings in the week ended November 14 totalled 785,000, which was practically 25 per cent. more than in the comparable week last year.

Passenger traffic likewise continues to improve at an increasing rate, and it is noteworthy that the Pennsylvania Railroad expected travel over the holiday (Thanksgiving, November 26) to exceed that at this period last year by 50 per cent.

Innovations in Freight Service

Efforts by the road hauliers and local carters to prevent the service by Court order having failed, the Eastern railways inaugurated free collection and delivery of less-than-carload freight on November 16. The hauliers threaten to continue their opposition until they have exhausted every possible legal method of stopping this service. The railways are not providing this service themselves, but have contracted with local carters (usually only one such firm in each community) to do it for them.

The Interstate Commerce Commission has approved a joint tariff of the Chicago Great Western and the Keeshin Transportation Company (a road haulier), whereby the vehicles of the latter company are transported between cities on the railway's flat cars. The road haulier provides the service at its regular tariff rates, and compensates the railway company by the payment of charges calculated on the basis of 5d. a road-vehicle-mile. Since two of these vehicles can be accommodated on a standard railway flat car, the railway will receive 10d. a car-mile without any expense of collection and delivery or loading and unloading.

Other railways had protested against this joint service, as, in effect, providing railway transport in accordance with road hauliers', rather than the railways' published rates; the commission, however, decided to permit its inauguration as an experiment.

Large Order for Locomotives

The New York Central on November 25 placed an order for 50 main-line passenger (4-6-4) locomotives and 50 shunting engines (0-8-0); this is the largest order for steam locomotives placed by any railway since 1930 (in which year the Chesapeake & Ohio ordered 105). A few days previously the Chicago, Milwaukee, St. Paul & Pacific had ordered thirty of the 4-8-4 type, and one "Hiawatha" (4-4-2) type, and there have been several orders recently for smaller quantities. All these locomotives will be built by private builders.

Many new freight cars are likewise being ordered, and during the past week the Union Pacific has made arrangements for the construction of 50 passenger cars; and the Chicago, Rock Island & Pacific has ordered six streamlined diesel-electric stainless-steel trains.

With traffic increasing so rapidly, and rolling stock inventory depleted through years of not buying, and with money available at interest rates of 2 to 3 per cent., there would appear to be every prospect that the coming year will be one of large-scale modernisation of the equipment by the railways; but the spectre of politics, and what effect it will have on railway earnings, remains to mar what would otherwise be an optimistic picture indeed.

INDIA

New Colour-Light Signals at Howrah

On November 15, the electro-pneumatic signalling system which has been in use in the Howrah station area for over 25 years was replaced by modern all-electric colour-light signals. It is understood that preparations for making the change have been in progress for nearly two years. Unfamiliarity with the entirely new method of operation of the new plant, coupled with certain electrical difficulties that occurred with the change-over, caused a number of trains leaving Howrah to be considerably delayed for the first three days, and this dislocation of train services naturally caused some considerable inconvenience to passengers. From November 18, however, all trains have left and arrived at Howrah at approximately scheduled time. There is reason to believe that when the staff gets familiar with the operation of the new system, there will be considerable simplification of movements. The new installation cost over Rs. 5½ lakhs (£41,250).

Criticism of Wedgwood Committee Personnel Answered

To the various Indian chambers of commerce that have recently complained to the Government about the absence of Indians from the newly-appointed Railway Inquiry Committee, the Government of India has replied that it was convinced of the need of appointing as members of the committee only acknowledged railway experts; also that it had deliberately appointed those from other parts of the Empire to ensure that the conduct of the inquiry should, as far as possible, be free from any tendentious character.

The appointment of Mr. Cheadle as an additional expert on the committee is favourably received in responsible quarters as he hails from a country where conditions of railway operation bear some resemblance to those in India. It is also significant that Mr. Cheadle's railway is possibly the only large railway system in the world that is not beset with financial troubles.

It is understood that Sir Ralph Wedgwood intends to visit the principal cities and towns in India, and doubtless all prominent commercial bodies will be given an opportunity of fully expressing their views to his committee. The provisional tour programme includes visits to Lahore, Bombay, Madras, Calcutta, Lucknow and Cawnpore. It is understood that the committee will leave Delhi on December 1 and return about the third week of January.

SPAIN

Conditions at Valencia

Since Valencia has become the Government headquarters, the residents have become used to unusual happenings. At 1 a.m. a few days ago 2,000 French volunteers, headed by a band, paraded through the streets of the blacked-out city and entered the station to the accompaniment of martial music. A long train composed of 21 six-wheel wooden coaches, awaited them, but, despite great over-crowding there was accommodation for only half the militia. There was considerable confusion in the coach occupied by the band and more than one instrument must have sustained injury during the melee. After a wait of half an hour a diminutive 2-6-0 locomotive was attached, and with much slipping pulled the train out of the station to the accompaniment of cheers from onlookers. Following another wait of half-an-hour a similar train left with the remainder of the troops for Madrid.

Partly as a result of poor transport facilities, Valencia has become congested with troops waiting to leave for the front and with refugees. The present population is probably double the normal, and travellers must be content to eat and sleep anywhere. Every type of motor vehicle has been impressed into relieving the situation. Refugees are being distributed in every town in Government territory and civilians have shown a wonderful response in assisting these unfortunates.

Railway news from other parts of Spain is at present exceedingly meagre. The bad weather and the deadlock around Madrid are conducive neither to much movement nor to either side being willing to impart much information about conditions in its own territory. The Norte station in Madrid has recently again been subject to intense bombardment and its seems probable that there is now little left of this fine structure.

XUM

ELIMINATION OF LEVEL CROSSINGS IN NORTH AMERICA

At Syracuse (U.S.A.) a five-mile elevated line, with a palatial new passenger station, now replaces the old street-level tracks running through the centre of the city, and at London (Ontario, Canada), very similar new works have recently been completed

(*See illustrations on pages* 1070 *and* 1071.)

IN an editorial note published in our issue of October 9 last, we announced the elimination of the New York Central main line traffic from some of the main thoroughfares of Syracuse, and of 62 level crossings; also the opening of the five-mile elevated line through the city to which this traffic has been transferred. It should be explained, however, that in addition to the New York Central double-track main line, there were also the West Shore Railroad main line, and the Syracuse junction, Watertown, Chenango, and Auburn branches, as well as two shorter industrial lines, various yards and sidings, all of them at street level within the city. The West Shore line ran parallel to, and north of, the New York Central tracks.

So complex has been the construction of the new line that, after years of negotiation, survey and planning—referred to in an editorial this week on page 1055—six years elapsed before it was finished. Following the West Shore alignment through the city, the new line incidentally provides a very fine new passenger station on Eric Boulevard, and has three or more tracks throughout its length.

Bridging and Earthwork

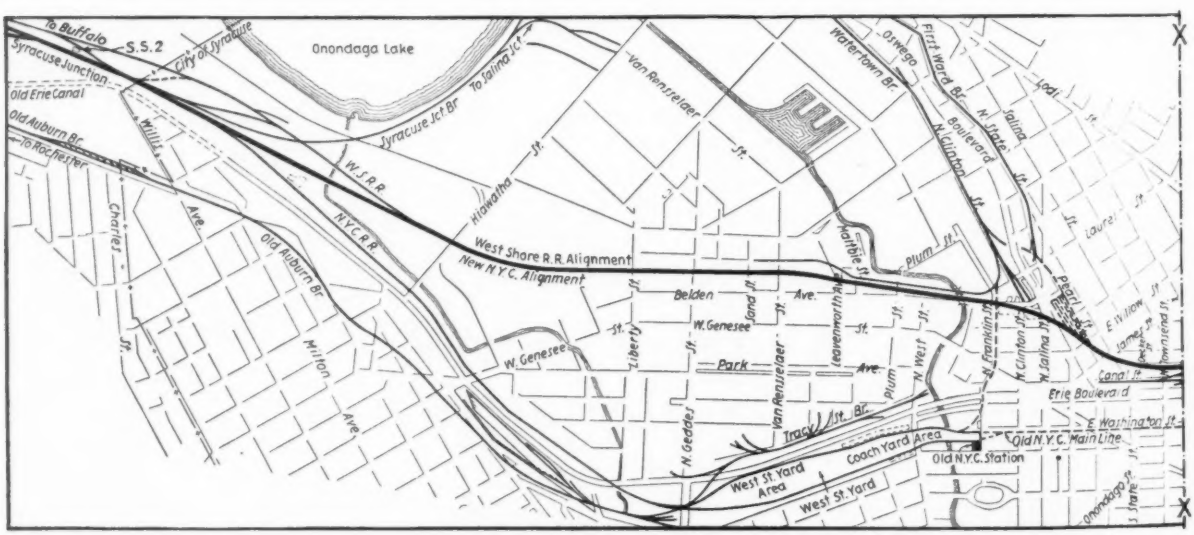
Bridging has been heavy, there being 31 bridges in addition to a subway at South Geddes Street, containing some 14,000 tons of steelwork. Retaining walls measure over 1½ miles in aggregate length. Altogether about 120,000 cu. yd. of concrete masonry and 300,000 linear ft. of piles, concrete and timber, were used.

But the bulk of the new elevated line is composed of embankment, thrown up for the most part by a novel method. The soil was excavated some miles away by drag-line dredger, carried to a point alongside its final position and there dumped. It was then lifted by other dredgers to form a single-line bank at final height. The lengths of single-line bank thus formed between bridges were also linked up by temporary bridges, so that a continuous service line could be run through from which the remainder of the fill could be dumped to carry the other two parallel tracks.

Various Individual Works

Some of the most interesting and intricate features of the work, which was begun in 1930, were the elimination of the most easterly level crossing in the city at Thompson Road; elimination of the Nichols Avenue level crossing by extending Midler Avenue on a steel bridge over the West Shore tracks; the subway at South Geddes Street; and, of course, the new passenger station. The elimination of the Thompson Road crossing was accomplished by carrying the road on a steel viaduct 1,660 ft. long and no less than 50 ft. in height over the tracks of the West Shore Railroad at the point where they cross over those of the New York Central, so that there are three levels at this intersecting point. South Geddes Street subway involves a cutting some 800 ft. in length in which the street is carried between concrete retaining walls; it is spanned by three railway bridges. Extensive alterations of junctions were necessary at several points to provide connections between the different branches and sidings, and the new alignment, and, of course, to connect it with the old lines at each end.

A new freight yard has also been constructed east of Peat Street. It may here be mentioned that the approaches at each end of the elevated line are graded at 1 in 330, and that the intermediate stretch is practically level and is carried at a height of roughly 20 ft. above the streets. Except in the middle of the city, where the



Sketch plan of the City of Syracuse, showing the old and new New York Central routes traversing it,

avoidance of costly properties made it imperative to use curves as sharp as 1,910 ft. radius, all other curves on the new line have radii of 2,865 ft. or more.

The New Passenger Station

There are ten through tracks in the new passenger station, eight of which are adjacent to the four island platforms. These are 22 ft. in width and are covered with tiled and concrete canopies or umbrella roofs, 26 ft. in width; the two middle platforms are each just over 2,000 ft. in length. Each platform is reached by two subways 12 ft. wide, one being for luggage and parcels, with lifts, and the other, with stairways, for passengers. The approaches at both ends of the station are safeguarded by interlocking controlled from a central tower overlooking the station building. Further details of the installation will be found below.

The station building, which is 160 ft. in length and 95 ft. in width at street level, consists of a central block four storeys high and two three-storey wings. At street level there is a main waiting hall two storeys in height, with booking offices, luggage and parcels registration, telegraph, telephone and other offices, and a restaurant, surrounding it. The upper floors are occupied by local Engineering and Operating Department offices. The waiting hall is the principal feature of this station, as it is unique in its decoration and furnishings. Comfortable red leather chairs and settees, placed in groups, take the place of the ordinary waiting room benches. Large rugs and table lamps give this hall the air of a hotel lobby rather than a station waiting room. Its general appearance will be seen from one of the illustrations we reproduce. A passenger car shop has been built at the east end of the station yard for all ordinary minor repairs.

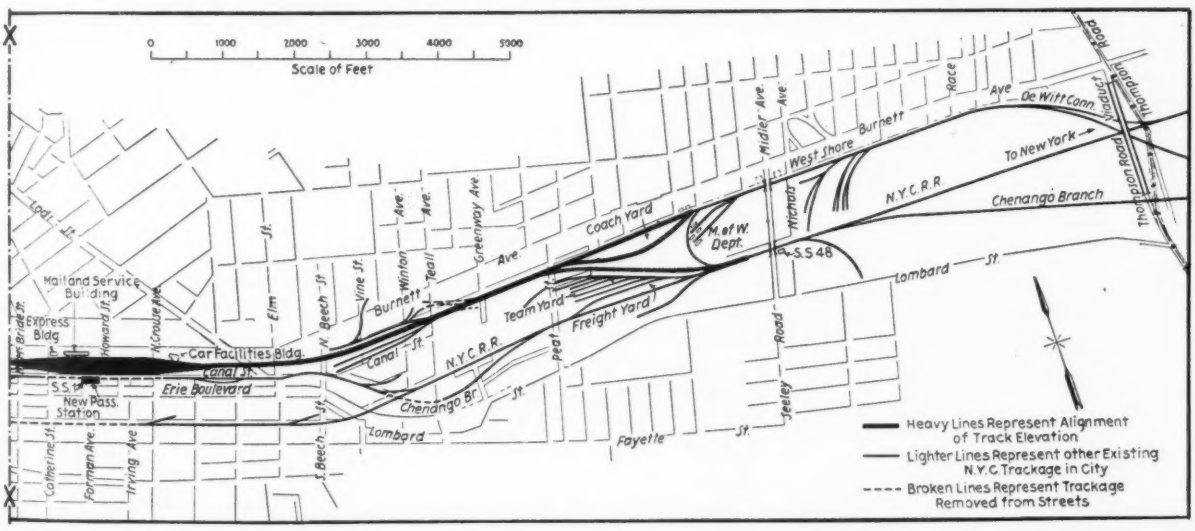
Signalling and Interlocking

There are three controlled signalling areas connected by automatic intermediate signals; where the new line leaves the main line at the west is a 63-lever electric interlocking installation; centrally there is the new passenger station yard with a C.T.C. all-electric control plant combined with an illuminated diagram; and a 24-lever mechanical installation at the east end of the new line. Searchlight colour-light signals are used throughout, and the whole of the electric signal equipment was supplied and installed by the General Railway Signal Company.

The importance of all these extensive new works will be appreciated when it is realised that not only all ordinary traffic, both goods and passenger, but also the crack expresses between New York and Chicago have until now had to slow down to a speed of from 10 to 15 m.p.h. in passing through the long streets of the city. By the completion of the new line, fast running is permissible, a matter of great importance in these days, when the speeding up of traffic, especially on competing routes, is so essential in railway operation. The added facilities provided by the new station, goods yard and other amenities are also in keeping with the importance of Syracuse, a city with 200,000 inhabitants. [We are indebted to the *Railway Age* for the plan of Syracuse reproduced below.]

New Works at London, Ontario

The works now completed for the elimination of level crossings at London follow the same general lines as those at Syracuse. A new higher-level line replaces that at street level, and on this new alignment there are six underbridges and one overbridge, and six streets have been closed, all in place of level crossings. Most of this part of the work has been finished for some time, but the scheme as a whole has only recently been completed by the opening of the new station, which is on the site of the old one it replaces. There are six platform lines and a seventh platform face for parcels, the adjacent tracks being about 7 ft. above street level. The entrance, business lobby and various offices are at street level, and from them a ramp leads down to the passenger concourse under the tracks, also reached by a subway from the far side of the railway; the concourse is 117 ft. long, 35 ft. wide and 19 ft. in height. Architecturally the whole station follows modern restrained classic lines and has a stone exterior with a 200-ft. main façade. Internally the buildings are handsomely decorated and fitted, somewhat on the lines of Syracuse station, already described. Two ramps lead from the concourse to each platform, which is covered for a length of 1,500 ft. by an umbrella roofing. Up to formation level the main station building is built in reinforced concrete, but above that level it has a steel frame with r.c. floors and roof slabs. The concourse is a fixed frame arched r.c. structure with 3 ft. 6 in. thick walls and 2 ft. 6 in. arches at the crown; the concrete was poured in four sections and vibrated. There is an imposing main entrance from York Street flanked by sculptured figures of " Commerce " and " Engineering."



and the alignment of the former where now removed from the streets ; the West Shore lines are also shown

THE BELGIAN LIGHT RAILWAY SYSTEM

The system of light railways adopted in Belgium is the most extensive in the world and now comprises 4,689 km. of railway in operation and 3,003 km. of bus routes

IN no country of the world has the importance of light railways been more fully recognised than in Belgium, where the *chemins de fer vicinaux* have been amongst the principal causes of the agricultural and industrial development of the country. The jubilee of the foundation of these railways was attained in May, 1884, but because of the recent publication of a brochure dealing with the fiftieth anniversary celebrations of the Société Nationale des Chemins de fer Vicinaux, the present seems a suitable time to give some description of this unique system of light railways. This brochure was reviewed in THE RAILWAY GAZETTE of July 31 last at page 179.

The first inception of an idea for a secondary system of railways was contained in the Tramway Law of July 9, 1875, but, owing to lack of private enterprise, only one concession was applied for to build a short line from Javiers to Ernbrasin in 1878. Although plenty of capital was forthcoming for suburban tramways, the public was not prepared to risk money in building light railways in country districts, which did not at that time promise large returns. From 1870 onwards the Belgian State had ceased to grant any new concessions for main line railways to private enterprise. Shortly after 1880, the main railway system was considered to be practically complete, and the problem arose as to the best means of developing those parts of the country in which the building of first class railways seemed warranted neither by population nor resources. It was not thought advisable that light railways should be constructed or worked by the State which was feeling the burden of the amounts paid for the purchase of many of the main lines from the concessionnaire companies, and had its own system of tariffs which had been adjusted primarily in the interests of long distance traffic.

Co-operation of Public Authorities

The principle was accepted at the outset that any comprehensive system of light railways should not compete with the existing State lines, but instead act as a feeder, and that the co-operation of the public authorities should be secured. Moreover it was not considered desirable to allow entirely free play to private enterprise, owing to the possibility of having only those lines constructed which seemed to promise well as commercial undertakings, while the sparsely-populated and poor districts which it was specially desired to benefit would remain deprived of adequate transport facilities. A commission was appointed in 1881, and at its second sitting a remarkable pamphlet by MM. Bischoffsheim and Wellens was presented setting forth proposals, which, in their essentials, were eventually adopted as the basis of the new light railway scheme. The authors thought that the system proposed by them would by associating private enterprise with a measure of State and municipal control preserve the advantages of private undertakings by acting with greater rapidity and initiative, in investigating schemes with complete independence, free from local influences, political or otherwise, and by adapting itself better to actual necessities and conditions. Amongst the chief points settled by the commission were the following:—

The State must prevent competition with the main lines by granting concessions only to light railways which cannot compete in this respect. The State must preserve the right to prohibit reductions in rates and charges, and, if necessary, to compel the rates to be increased. The light railways must act as feeders to the main lines, and not run parallel therewith.

As the result of the recommendations of the commission a law was passed on May 28, 1884, and a slightly amended law on June 24, 1885, by which the *Société Nationale des Chemins de Fer Vicinaux* was formed. The company was granted a practical monopoly for the construction of light railways, and was exempted from certain taxes. The first light railways to be opened for traffic by the Société were those from Ostend to Nieuport on July 15, 1885, and from Antwerp to Hoogstraeten on August 15 of the same year.

Unique Form of Company

The company so formed may be regarded as unique of its kind. It was intended to be a commercial undertaking, but also to work in co-operation with the public authorities, in order to provide in perpetuity a public service, free from any spirit of profiteering, and therefore was granted a monopoly which only a subsequent change in the law could affect. It has been described by economists as one of the first companies *d'economie mixte*. The financial structure was also new. The share capital was to be provided conjointly by the State, the provinces, the communes (rural and district councils), and private individuals, but it was expected that far the greater part would be subscribed by the public authorities. The State's share of the capital expenditure was fixed at a maximum of one-half. In the year before the war the respective proportions subscribed of the then existing capital of fr. 370,948,000 were: 44·1 per cent. by the State, 27·9 per cent. by the provinces, 26·8 per cent. by the communes, and 1·2 per cent. by private individuals.

To prevent local authorities being saddled with the burden of finding the whole of their share of the capital expenditure in a lump sum, it was provided that they might raise the money in the form of annuities valid for 90 years, bearing interest at 3½ per cent. (later raised to higher percentages). These payments combined interest and sinking fund charges, and the annuity system was generally adopted. At the end of the ninety years the shares become the absolute property of the shareholding bodies. Concessions for light railways are granted by the State after strict enquiries. If the Government expresses its approval, the National Society ascertains how much capital will be required, and a limited liability company is then formed for its construction and equipment. The State guarantees not only a dividend of 3½ per cent.—later raised to 3·65 per cent.—upon all the share capital subscribed by the three public authorities, but also the security of the principal. When the capital for a line has been fully subscribed, the Société Nationale issues bonds (obligations), the State guaranteeing the whole of the bond issue towards third persons as regards both the annual interest and the liquidation of the loan at the end of 90 years. Furnished with this guarantee the Société Nationale had no difficulty in issuing 3 per cent. bonds, which were redeemed as the sinking fund accumulated. Under this arrangement the Société Nationale obtained the needed capital on terms as low as those on which the State could borrow, and

the State was not burdened by any addition to its debt, or by the heavy responsibilities which would have resulted from complete nationalisation. The price at which bonds could be issued varied according to the state of the money market, but in order to maintain stability the Société Nationale built up a reserve fund from profits realised on the issue of bonds above par, for meeting losses due to the issue of any bonds below par.

Each railway forms a distinct and separate undertaking belonging to a limited company formed for the purpose, with its own separate accounts, so far as concerns construction and operating expenditure, and bears its share of the general expenditure of the Société Nationale in proportion to its gross receipts. The work of construction is let on contract, but is supervised by the officers of the Société Nationale. As a general rule the Société Nationale before the war did not work its own railways, but leased them to companies under working agreements which usually provided that the Société Nationale was to receive amounts varying from 30 to 40 per cent. of the gross receipts. The Société Nationale provided the rolling stock, and the working company was responsible for all repairs and replacements. Generally speaking the agreements were for a period of 30 years, with the right of cancellation at the end of fifteen. It frequently happened that one company contracted with the Société Nationale for working several separate railways. At the end of 1906, for instance, 138 different light railways were being worked by 37 companies, some of which were working as many as eleven separate lines.

Administration

The affairs of the Société Nationale are administered by a board of directors, consisting of a president, a vice-president, and five directors. Members of the first directorate, numbering five all told, and the general manager were nominated in 1884 by King Leopold II, and successive presidents and general managers have been nominated by the reigning sovereign for the time being. The other members of the board are appointed half by the King and half by the shareholders. There are also two Government Commissaries, and a supervisory committee, elected by the shareholders, of nine members, including a president, one from each of the nine provinces. In accordance with the statutes of 1885, the profits are divided as follows: A " first dividend " is paid equivalent to the annuity charge. Of the surplus, after payment of certain bonuses to the members of the directorate and the general manager, one-quarter goes to a fund for the extension and improvement of the particular line, three-eighths to the Société Nationale as a reserve fund for covering possible loss and for the extension and improvement of the system as a whole, and the remaining three-eighths forms a second or final dividend.

Rapid Growth

From the commencement this light railway system was attended with singular success, and the rapidity of its development was remarkable. The first report, covering the year 1885, showed that 58·5 km. of lines were already in operation by August of that year. By December 31, 1889, after five years' work, 704 km. (made up of 35 lines) were in operation and 104·5 km. were under construction. The capital had reached fr. 33,552,000, the receipts were fr. 2,196,980, and the operating ratio 73·28 per cent. Five years later, at December 31, 1894, after ten years of existence, the company had obtained concessions for 1,341·5 km. (66 lines) of which 1,249 km. (62 lines) were in operation, and the capital had reached fr. 64,033,000. In fact, the system had nearly doubled itself since 1889 and the rate of construction showed no sign of slackening. Receipts were fr. 5,343,390 and the operating ratio had fallen to 70·57 per cent. By 1904 the length constructed had risen to 2,494 km., the gross receipts to fr. 13,534,156, and the capital to fr. 196,830,000. Amongst the important developments during the ten-year period 1894-1904 were the opening to electric traction on October 1, 1894, of the line from Brussels (Place Rouppe) to La Petite-Espinette. Between 1904 and 1909 the electric lines had increased from 97 km. to 241 km., and in 1913 had advanced to 410 km. Meanwhile there had been a further development of steam lines, and the total system in operation at the end of 1913 consisted of 4,094·74 km., of which 3,684·94 (these very approximate figures are as given officially) were operated solely by steam, 268·24 solely by electricity, and 141·56 were partly steam and partly electric. Apart from 506·3 km. of 1·067 m. gauge and 38·1 km. of standard gauge, the system was of metre gauge. On the eve of the war, in spite of a tendency for expenses to increase, because of larger payments to the staff to meet the higher cost of living and because of higher prices for materials, the Vicinaux lines were in a prosperous condition. The advances to non-paying lines were barely fr. 483,377, whereas the reserve fund stood at fr. 8,256,390. Of the 145 lines in complete operation in 1913, 53 paid a dividend in excess of the annuity (4·35 per cent.), 52 a dividend of over 2 per cent., and 40 a dividend below that. The sum of fr. 8,032,716 was distributed in dividends, giving an average return of 2·82 per cent. Total receipts were fr. 28,201,490 and expenses fr. 20,260,082, the operating ratio being 71·84 per cent.

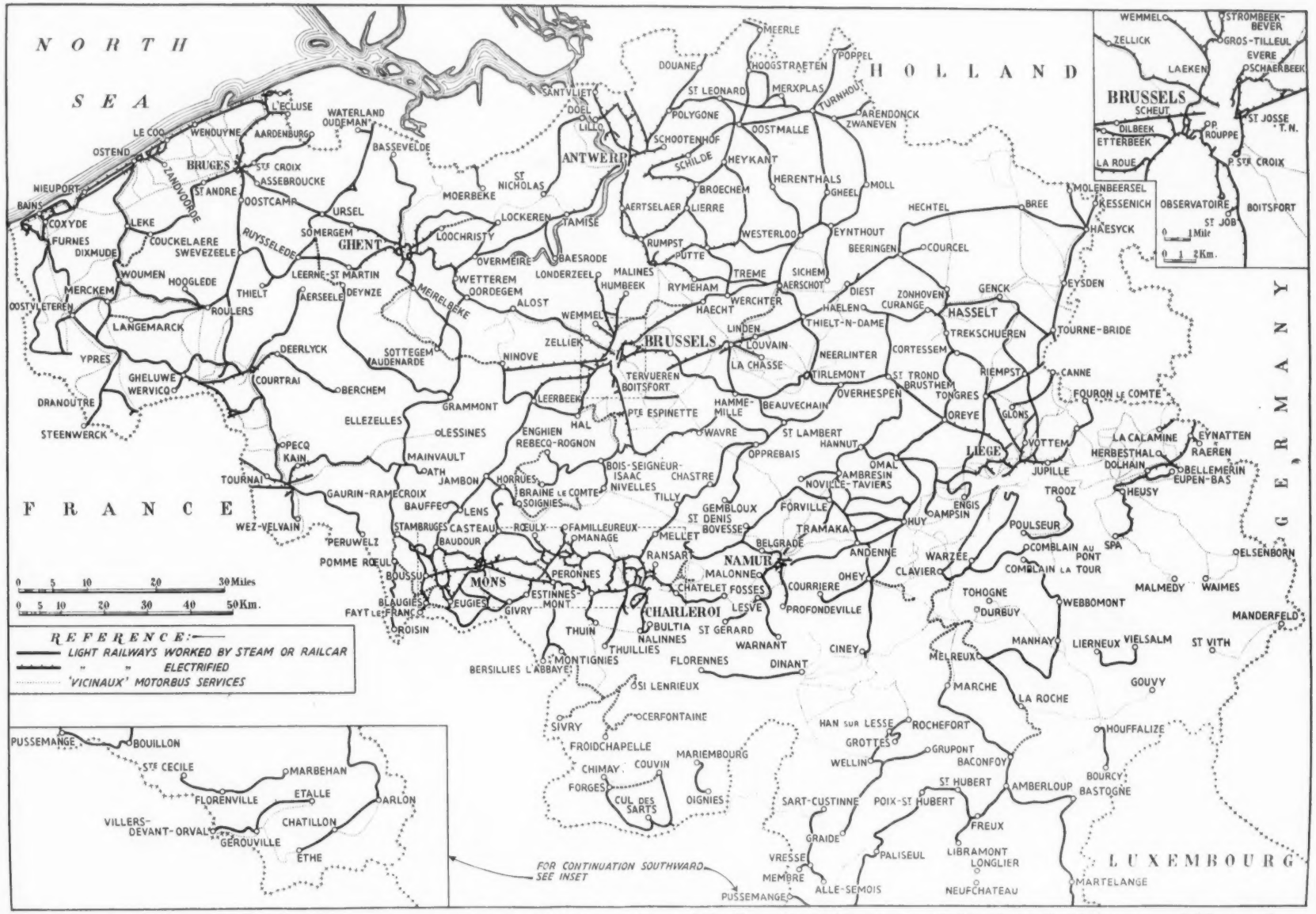
When the German troops had occupied Belgium they took over at once the main lines belonging to the State, but they did not at once realise the importance of the Vicinaux and their demolition was gradual and incomplete. Meanwhile the companies working the Vicinaux lines combined to provide, under great difficulties, through long-distance services to meet so far as possible the needs of the civil population. Goods receipts were maintained during the war at much their former level, and in 1918, although the length of line in operation was reduced to 1,865 km. only, passenger receipts were almost double those of the entire system in 1913.

After-War Problems

After the war the work of re-construction and re-equipment was resolutely taken in hand, and by the end of 1921 the restoration to working order of 2,236 km. of line was an accomplished fact. The obstacles encountered were enormous, including the high price of materials and the delay in their delivery, and the rising curve of salaries and wages, which an average increase of not more than 100 per cent. in tariffs failed to meet. A further difficulty was that the private companies which had hitherto worked almost all the Vicinaux lines hastened to take advantage of the law of October 11, 1919, which allowed the cancelling of certain working agreements made before the war. The working of the more unprofitable lines was given up at once by the companies concerned, and the lines which still promised a profit were not ceded to the Société Nationale until the normal time of expiring of the agreements. At the end of 1920 the lines worked directly by the Société Nationale amounted to 3,175 km., and those still leased were 1,119 km.; at the end of 1921 there were 3,558 km. worked directly and 936 km. leased; at the end of 1922 the respective proportions were 3,515 km. and 779 km. By the end of 1935 the length of line worked directly by the Société was 4,458 km., and 231 km. were leased.

Re-Grouping

Resumption of working by the Société provided an opportunity for reform by re-grouping of lines according



Outline map of the extensive light railways system of Belgium with enlarged inset of the Brussels neighbourhood. Enlarged details of lines around Mons and Charleroi are shown in the map on the opposite page

to provinces and placing a responsible officer at the head of each group. In groups comprising 400 km. and over this enabled reserves of rolling stock to be reduced and facilitated interchange of stock required for seasonal traffics. Another benefit was the concentration of well-equipped workshops at important centres, in place of numerous small and poorly-furnished depots. A difficulty which had to be faced was that on the expiry of the working agreements—mainly for 30 years—permanent way and other equipment had mostly reached the limit of their useful life. From the beginning of direct working by the Société it was necessary to build up out of working expenses a special fund for maintenance and renewal within a relatively short period, which meant a heavy supplementary charge.

Subscriptions by the shareholding public authorities for the modernisation of the system could only be obtained with difficulty and subject to great restrictions in consequence of the fall in the Belgian franc between 1923 and 1926. The stabilisation of the franc in 1927 re-started the flow of subscriptions, and although the financial crisis prevailing since 1931 has again diminished the resources of the public authorities, the subscriptions in 1933 amounted to fr. 76,000,000 of which fr. 29,500,000 were ear-marked for purchase of railcars. The shareholders' efforts have also been further hampered since 1931 by road competition.

Road Competition

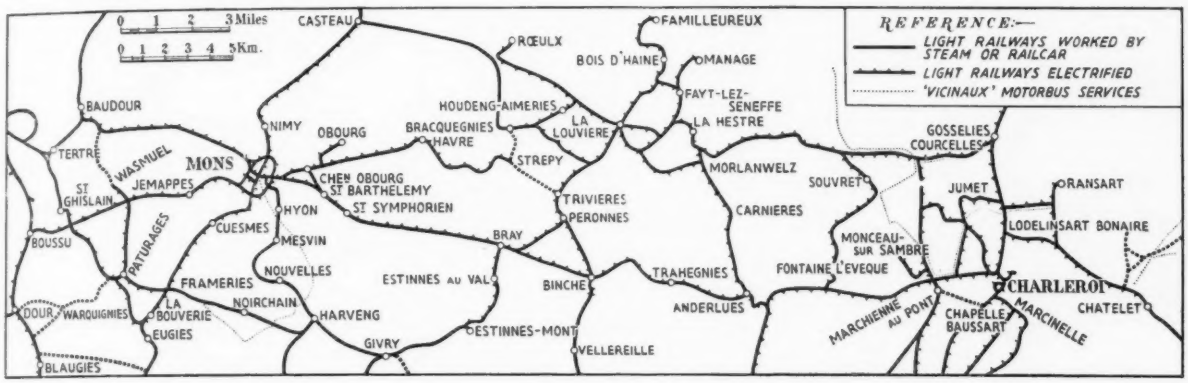
Laws passed in August and September, 1924, had given the Société a preferential right to run buses: (1) along the route of lines conceded or under consideration; (2) along the route of existing lines; (3) to link up lines. This legislation was well-intended but did not do what was expected. There was a duality in licensing authorities: the Société got its concessions from the Minister of Railways, and the private buses got theirs from the Minister of Agricultural and Public Works. It took longer for the Société to obtain concessions partly owing to the difficulty of the public authorities in providing funds. In addition several private buses were run without authority. The Société cannot be accused of any want of forethought in relation to road competition, as it called attention to the matter so early as 1899.

Had it not been for electrification the losses to road competition both in passengers and goods would have ruined the Société. In the 10 years 1924-33 729 km. were equipped and brought into use for electric traction, and by the end of 1935 1,290 km. were electrified. On the electric lines the operating ratio was 93·57 per cent., and on the other lines 114·29 per cent., and of the steam lines 2,518 km. were worked at a loss. For the whole system the operating ratio was 100·36 per cent., and there was a loss on working of fr. 805,948. The average dividend paid was 1·5424 per cent., against 1·4399 per cent. for the previous year.

Railcars

On the steam lines also, adaptations of the older rolling stock and the adoption of railcars have greatly improved the traffic position. 25 petrol-driven railcars were put in service in 1935, and most of the 106 heavy-oil railcars sanctioned in 1935 have been put to work with satisfactory results. The Société has in view a programme for a total of 250 units, and expects that in the near future steam traction will be superseded except for the transport of heavy loads. The company itself now works omnibuses over about 462 km. of route, and has leased to other undertakings the working over about 2,541 km. But the situation will never be really satisfactory until the present duplication caused by the running of services by other undertakings along routes parallel to the railways is replaced by a thoroughgoing system of co-ordination.

It has been a great tribute to the foresight of the founders of the Belgian light railway system that the laws under which it was originally sanctioned have undergone so little alteration. By the law of 1927 the minimum of shares to be subscribed for by the public authorities, which was formerly fixed at $\frac{2}{3}$, has been reduced to 55 per cent. On the other hand, the rate of interest due in case of postponement of the payment of annuities has been raised to 8 per cent. In addition the new law provides for the constitution of a national commission and of regional commissions to deal with staff matters.



The comprehensive system of light railways around Mons and Charleroi

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THE RAILWAYS AND CHRISTMAS.—Once again the British railways have prepared an appropriate welcome for the many hundreds of thousands of extra passengers who will be travelling during the Christmas holiday period. On pages 1072 and 1074 we show the sort of preparations made by the L.M.S.R. and G.W.R. These should gladden the hearts of all travellers, even those who miss their trains! The L.N.E.R., too, is decorating some stations with Christmas trees, which will serve, incidentally, as in previous years, both a charitable and a decorative purpose. The Southern Railway will be especially busy carrying pleasure-seekers away to the Continent for winter sports and other diversions. All four railways are dealing with extra-heavy parcels and freight traffic involving many special trains. Restaurant and buffet cars will be particularly popular, and the G.W.R. cars alone will account for 4,000 lb. of turkey, 4,000 lb. of Christmas pudding and mince pies, and 40,000 bottles of liquid refreshment.

XUM

AN INTERESTING FREIGHT TRAFFIC PROBLEM

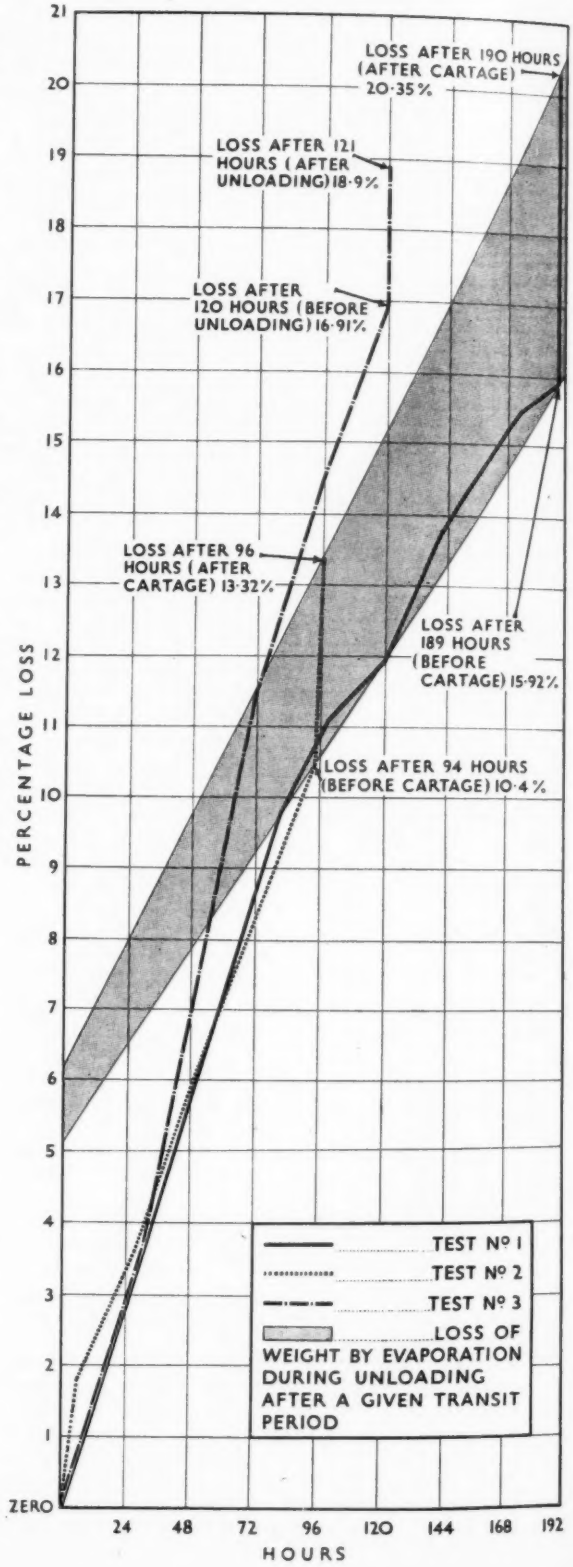
(*See editorial note on page* 1053.)

AS a result of complaints from Worthing fruit growers that they were receiving short weight consignments of manure carried by the Southern Railway from London, the railway company, in conjunction with the consignors and consignees, recently initiated an investigation into the possible causes of the shortages. At the outset, it was established that the methods adopted at goods depots from which the manure was forwarded, ensured that the weighing was efficiently carried out, and that there was no ground for any suspicion that the amounts loaded into the wagons in the first place were other than correct.

Attention was then given to the possibility of loss during transit, and investigation in this direction revealed that considerable losses invariably occurred through evaporation. Tests were, therefore, carried out with a number of truck loads to ascertain the extent of the loss over varying periods of time taken in transit. These are summarised in the accompanying graph, which shows the percentage of loss against each hour. The daily fluctuations were found to be accounted for largely by weather conditions. Observations showed, for instance, that the evaporation was greatest between 9 a.m. and 4 p.m., when the sun and drying winds had their effect. The backdraught created by the passage of the train, however, had also to be taken into consideration. For instance, one test with a truckload conveyed by night revealed a loss of 2½ cwt. on the journey. The tests also showed losses during unloading amounting to as much as 2·92 per cent. after 96 hr. and 4·43 per cent. after 189 hr. in transit. This extraordinarily rapid evaporation is explained by the comparatively high temperature of the truck, the degree of which is proportionate to the length of the journey time. The estimated extent of this loss after any given time, within the limits of the tests, is shown on the graph by the shaded area.

Most of the more serious losses occurring during the period of the tests were found to be owing to delays in traffic arising from the Aldershot Command territorials requiring the use of the stations to which consignments were despatched. This, it was considered, however, could be avoided if the contractors were notified in advance so that forwardings could be suitably altered. If, for instance, Angmering were fully occupied with army traffic, the consignments could be sent instead to West Worthing, whence they could be collected with almost equal convenience. This was found to be of importance, as the longer delays, in addition to causing greater quantitative losses, resulted eventually in a serious deterioration in the quality of the manure. In this connection it should be explained that experts consulted contended that the actual loss in weight was not very important, but that the fermentation, being non-aerobic, was harmful to the manure, which was required chiefly for the cultivation of mushrooms. To prevent delay at the arrival stations, it was further decided to give telephonic advice to the consignees immediately on the arrival of loads at the station. Junctions, moreover, particularly Hove, were to be warned of the need for avoiding lengthy holdups. These and other precautions, now taken by the Southern Railway as a result of the experience of the tests, have enabled delays to be reduced to a minimum, with the added benefit of quicker turn round of wagons.

For convenience three typical tests only are recorded on the accompanying graph, and these have been numbered accordingly. The plotting of the shaded area, of course, takes into account the whole series of tests.



A RAILWAY-OWNED DOMINION AIR SERVICE

South African Airways

NOW that the Empire Exhibition at Johannesburg is in progress, special interest attaches to the South African Airways, which are controlled and operated by the Railway Administration of the Dominion. During the exhibition increased use is being made of these airways by those visiting Johannesburg from all parts of the sub-continent and beyond, and special facilities are being provided by the management for this purpose. The South African Airways administration has recently taken over the southern section of Imperial Airways London to Cape Town route and now operates a bi-weekly service which connects with the London-Johannesburg service.

With the taking over by the Union Government on February 1, 1934—recorded in our issue of March 30 of that year—of a commercial aviation company (Union Airways) which for 5½ years had operated regular air services between Durban and Johannesburg, and Durban and Cape Town, the airways were incorporated in the services of the South African Railways and Harbours Administration under the title of South African Airways.

A proper departmental organisation was introduced under the control of an Airways Manager responsible to the General Manager of Railways and Harbours. The internal organisation consists of three divisions, namely, Commercial, Flying Operations, and Engineering, each under the control of a senior official responsible to the Airways Manager. They are not, however, regarded as separate departments but their functions are closely correlated as part of the air transport undertaking as a whole.

Passengers disembarking from air liner, S.A. Airways

At the time the Government took over the Union Airways that company had on order three 14-passenger multi-engined Junkers air liners, with a cruising speed of 154 m.p.h., and these aircraft, after having flown out to South Africa, were added to the Airways flying strength in November, 1934. These liners were placed in service on the Durban—Johannesburg and Durban—Cape Town routes in place of the four- and six-seater Junkers W.34 and F.13 previously used. Prior to the arrival of these machines the administration had experienced great difficulty in maintaining its schedule services with the single-engined aircraft taken over from Union Airways, but with the introduction of the multi-engined machines and the inauguration of a daily service between Durban and Germiston (Johannesburg) from January 1, 1935, a steadily increasing number of passengers made use of the services.

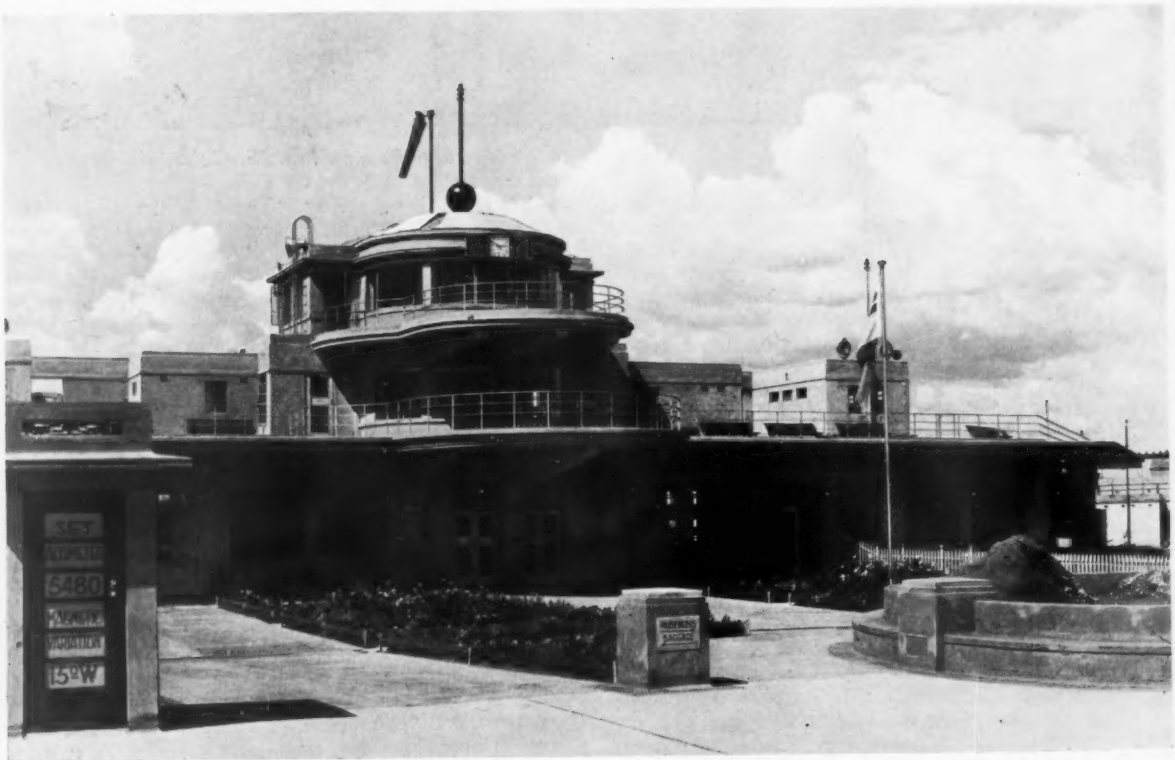
In the light of the experience gained in the operation of multi-engined aircraft the Government decided to maintain the regular services with this type of aeroplane, and a fourth machine, which arrived in South Africa in June, 1935, was at once placed in service. Certain new features were embodied in this machine; the cabin was considerably lengthened and with this additional space and the use of a different type of table it is possible to convert the four seats therein into two beds, thus making provision for the transport of invalids and stretcher cases when required. Provision was also made in the estimates for 1935-36 for the purchase of three additional multi-engined machines.

It is proposed in the near future to inaugurate a direct service between Johannesburg and Port Elizabeth, and also between Johannesburg and Lourenço Marques in Portuguese East Africa, the latter to include a stop at Komatipoort when traffic is offering to the Kruger National Park. For these services the administration has ordered four Airspeed Envoy aircraft. These are six-seaters with a cruising speed of 189 m.p.h., powered with two Armstrong-Siddeley Cheetah IX engines of 340 h.p. (moderately supercharged). Three similar aircraft are destined for the Defence Department and the first of these machines was flown from England and arrived in South Africa on July 10 last. In addition, and as recorded in our issue of April 10 last, the administration has ordered three Junkers Ju.86 air liners with accommodation for ten passengers. These liners are powered with two Rolls-Royce Kestrel (supercharged) engines of 740 h.p. and they will have a cruising speed of 214 m.p.h. at 14,000 feet.

Under the existing schedule a daily service in each direction operates between Durban and Johannesburg, leaving Durban at 8.0 a.m. and arriving back there at 1.15 p.m., the journeys each averaging just over two hours. In view of the necessity for the service linking up with the weekly mailboat, the plane leaves Durban on Thursdays at 2.0 p.m. and spends the night at Uitenhage (Port Elizabeth), continuing the flight so as to arrive at Cape Town at 1.0 p.m. on Fridays. On the return trip the 'plane leaves Cape Town at 9.0 a.m. on Mondays with the incoming mails and reaches Durban at 5.30 p.m. the same day. On the direct route between Cape Town and Johannesburg a slight detour is now made to permit of a stop being made at Bloemfontein, in addition to Beaufort West and Kimberley.

The air liners on all routes are equipped with the latest

The aerodrome, Cape Town



Rand Airport buildings, Johannesburg, South African Railways and Harbours

direction-finding wireless apparatus and a series of ground stations similarly equipped is laid down throughout the Union. A system of triangulation is thus provided which will enable a pilot on any of the main routes to ascertain his position with the utmost accuracy.

In pursuance of the policy of having a State-owned and -operated internal air service the administration took over the South-West African Airways as from February 1, 1935, the purchase price of the assets being £7,000. Included in these assets were three all-metal Junkers A.50 single-engined machines and five Genet Major Armstrong-Siddeley engines with which equipment the company had operated its services in South-West Africa. The company also ceded its rights under existing contracts, one of which was with the South-West Africa Administration and under

S.A.R. airliner passing Lion's Head, Cape Town

Interior of S.A.R. liner

which the administration paid to the company a subsidy of £7,000 per annum until March 1, 1936.

Concurrently with this purchase the S.A.R. & H. administration took over the operation of the weekly service in each direction between Windhoek and Kimberley, but instead of using the small machines previously utilised by the company, two of the four-seater cabin machines transferred from Union Airways were sent to Windhoek and placed in service on this route. The small machines of the South-West African Airways are now being used on special charter work for which there is a considerable demand in South-West Africa.

With the increased number of aircraft available the expansion of internal air services in South Africa became practicable, but a main air depot more central than Durban was essential. As recorded in our issue of July 12, 1935, an agreement was therefore come to with the Joint Committee of the Rand Airport to accommodate the workshops and operating staff at Germiston, and permanent buildings for South African Airways will be erected there. Pending the erection of these buildings the transfer of the main depot to Germiston as a temporary measure took place as from July 1, 1935.

The effect of this transfer is that the public of Kimberley and Cape Town now have two air services a week in each direction, both connecting with Imperial Airways services between Johannesburg and the north. Concurrently also, the service between Durban and Cape Town was duplicated while the Kimberley—Winhoek service was retimed so as to give direct air connection between Windhoek and Cape Town and Johannesburg.

During the year ended March, 1935, freight rates by air were reduced, while full-fare paying passengers were given a free insurance voucher for £1,000. This, it is understood, is unique in the annals of air transport. The administration has also contributed its share towards the reduction in the postal rates which was brought into operation at the beginning of 1935.

In common with practically all other air transport services throughout the world which are not heavily subsidised, comparatively large losses have been incurred in the operation of South African Airways, principally owing to the heavy capital charges inseparable from such undertakings. The financial results, however, are, as stated in Mr. Watermeyer's report, not discouraging and have improved considerably since the control was assumed by the railways administration. The capital invested in South African Airways at March 31, 1935, was £124,095. The deficit in working for the year was £33,493. The total expenditure amounted to £57,263, of which £19,949 represented depreciation, insurance, and interest on capital. The total ordinary revenue was £22,439, or approximately 39 per cent. of the total expenditure. The three large multi-engined machines were, however, only in service for about five months of the year. The total deficit for the year was £57,156. "From a financial point of view, however, the position of South African Airways," says the General Manager, "is well on the up grade and the air transport facilities provided thereby may be regarded as of much greater value to the public than the extent of the comparatively small annual loss in operation likely to be incurred, which loss may be viewed in the nature of a subsidy by the State."

XUM

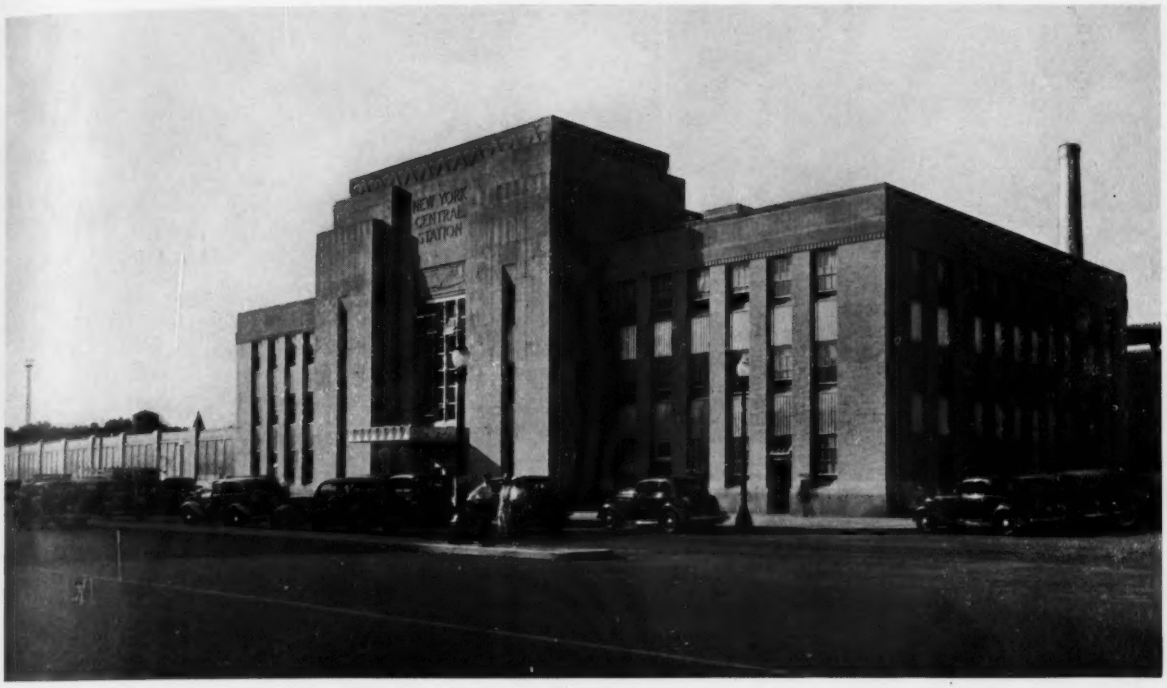
Elimination of Level Crossings in Syracuse

New York Central expresses between New York and Chicago have from the outset and until September 24 this year had to traverse the streets in the centre of Syracuse, N.Y., as the illustration below shows. Now, however, a high-level line has been constructed through that city (as seen in the illustration to the right), and a fine new station built, so that all main-line street level crossings have been eliminated

(*See article on page* 1060)

A typical view of the new high-level (elevated) line through Syracuse. The particular curve shown has replaced a length of line having five level crossings

A New York Central express traversing the whole 1.3-mile length of Washington Street, Syracuse, prior to the opening of the new elevated line last September. For nearly a century all traffic has been limited to 10-15 m.p.h.



Main façade of new New York Central station at Syracuse

Waiting hall in the new Syracuse station. It may be noted that red leather-covered steel chairs and settees have replaced the ordinary benches found in waiting rooms, and handsome rugs adorn the floor

XUM

Christmas on the L.M.S.R.

1. *The dining car*
2. *A festive load*
3. *Christmas parcels*
4. *Luggage in advance*

RAILWAY NEWS SECTION

PERSONAL

From *The London Gazette* of December 15:—

The King has appointed Col. the Rt. Hon. Lord Wigram, G.C.B., G.C.V.O., C.S.I., to be Permanent Lord in Waiting. Lord Wigram is a Director of the London Midland & Scottish Railway.

The King has awarded the Imperial Service Medal to two employees of the Road Transport and Tramways Department, New South Wales Government, and to three employees of the Tasmania Government Railways.

Col. L. Manton, D.S.O., O.B.E., relinquishes his appointment as Chief Engineer, Malta, and retires on retired pay (December 9). Col. Manton was a Traffic Officer on the Indian State Railways before the war, and was more recently Commandant at the Railway Training Centre, Longmoor.

We regret to announce the death, on December 13, of Mr. Thomas Richardson, D. L., Chairman of the Belfast and County Down Railway. Mr. Thomas Barbour, Deputy Chairman since 1932, has been elected to succeed him as Chairman, and Mr. James Hurst, J.P., has been elected Deputy Chairman.

ASSOCIATION OF AMERICAN RAILROADS

The Association of American Railroads at its recent annual autumn meeting in New York elected the following as members of the board of directors for the coming year:—

Mr. M. W. Clement, President, Pennsylvania Railroad.

Mr. C. E. Denney, President, Erie Railroad.

Mr. E. S. French, President, Boston & Maine Railroad.

Mr. Daniel Willard, President, Baltimore & Ohio Railroad.

Mr. F. E. Williamson, President, New York Central Lines.

Mr. L. W. Baldwin, Chief Executive Officer, Missouri Pacific Lines.

Mr. S. T. Bledsoe, President and Chairman, Executive Committee, Atchison, Topeka & Santa Fe Railway.

Mr. Carl R. Gray, President, Union Pacific System.

Mr. Hale Holden, Chairman, Southern Pacific Company.

Mr. W. P. Kenney, President, Great Northern Railway.

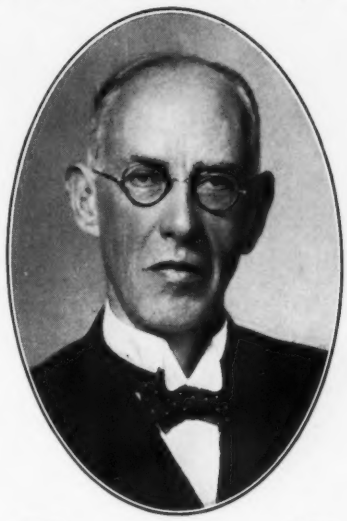
Mr. H. A. Scandrett, Trustee, Chicago, Milwaukee, St. Paul & Pacific Railroad.

Mr. L. A. Downs, President, Illinois Central System.

Mr. George B. Elliott, President, Atlantic Coast Line Railroad, and

Mr. J. B. Hill, President, Louisville & Nashville Railroad.

We regret to record the death, on December 14, of Mr. Ernest William Rowntree, C.B.E., Assistant Secretary (Secretarial Department), Ministry of Transport. Born in 1877 and educated at Bootham School, York, Owens College, Manchester, and Trinity College, Cambridge, Mr. Rowntree was appointed to the Railway Department of the Board of Trade in 1900, and was at various times Secretary to a



Elliott] [*& Fry*

The late Mr. E. W. Rowntree, C.B.E.,

Assistant Secretary in charge of the Secretarial Department, Ministry of Transport, since 1923

number of railway commissions, committees and conferences, including the Board of Trade Railway Conference (1908-9), the Committee on Railway Agreements and Amalgamations (1909-11), and the Royal Commission on Railways (1913-14). From 1909 to 1911 he was Private Secretary to the Parliamentary Secretary to the Board of Trade. At the beginning of the war he was intimately associated with the taking over of the railways by the Government. In 1919 Mr. Rowntree was transferred to the Ministry of Transport, and in 1923 was appointed Assistant Secretary in charge of the Secretarial Department, the position he retained until his death. The Secretarial Department has charge of all railways, harbours, docks, roads and associated administrative matters at the Ministry.

Lt.-Col. R. T. Harper, O.B.E., has been elected President of the Chartered Institute of Secretaries. Col. Harper is a Director of the Buenos Ayres Great Southern and B.A. Western Railways and Secretary of the Bahia Blanca & North Western and Buenos Ayres, Ensenada & South Coast Railways.

INSTITUTE OF TRANSPORT

The following have been elected associate members during November:—

Messrs. G. J. Ashton, L.M.S.R.; L. Cogger, Port of London Authority; E. L. Phipson, South African Railways and Harbours; G. N. Southerden, G.W.R.; and A. N. Stacey, Southern Railway.

The following administrative changes are announced by the Central Uruguay Railway of Montevideo and Associated Lines:—

Mr. H. H. Grindley, O.B.E., General Manager, has been elected a Director of the company.

Mr. Fairlie C. Pearson, Traffic Superintendent (Acting General Manager) has been appointed Assistant General Manager.

Mr. G. V. Bernays has been appointed Traffic Superintendent.

Dr. Luís P. O'Farrell, Chairman, Local Board, Buenos Ayres & Pacific Railway, returned to Buenos Aires from Europe on November 17.

Mr. Geoffrey W. Morkill, General Manager, Central of Peru Railway, returned to Lima on October 28, after an extended tour in England and Canada.

Captain J. V. Forster, General Agent of Canadian Pacific Steamships Limited at Southampton, has been elected a member of the Harbour Board to represent the owners of foreign-going vessels from that port.

INDIAN RAILWAY STAFF CHANGES

Mr. R. Bonar, Officiating Divisional Superintendent (Mechanical), Jamalpur, E.I.R., has been granted one year's leave, as from November 13.

Mr. C. H. Griffiths has been confirmed as Signal Engineer, E.B.R., as from May 22 last.

Sir Maurice Brayshay, Agent, B.B. & C.I.R., returned from leave and resumed duty on November 10.

Mr. W. T. Aldous, Traffic Superintendent, Broad Gauge, B.B. & C.I.R., returned from leave and resumed duty on November 10.

Mr. R. MacLean, Deputy Engineer-in-Chief, B.B. & C.I.R., has been granted 9½ months' leave as from November 27. Mr. A. E. Watkins, Deputy Chief Engineer, will officiate in his place, and Mr. A. H. M. Campion will act for Mr. Watkins.

Mr. N. D. Calder, Traffic Manager, E.B.R., has been granted leave preparatory to retirement as from November 30.

Christmas decorations at Paddington station, G.W.R.

The flooded station and houses at Mountain Ash, G.W.R., after the recent gale

Closed Branch Lines—VIII

Joint Railways in Great Britain

With the present list we complete our series of tables of closed branch lines, and those on which passenger services have been suspended. It is difficult to give precise mileage figures as in some cases the withdrawn service traversed, in addition to the actual branch, short sections of main line which remain in service for all traffic. We have therefore refrained from including mileages in our tables, but it may be said that the approximate total (excluding Ireland) of lines of the four group railways closed to passenger traffic in the last seven years is about 1,100 miles; this figure includes, of course, lines closed to all traffic.

To facilitate reference we append a list of the issues in which previous tables have been published:—

I.	Great Southern Railways of Ireland ...	August 28, 1936
II.	L.M.S.R.	September 4, 1936
II.	(Revised) L.M.S.R.	December 11, 1936
III.	Southern Railway ...	September 11, 1936
IV.	L.N.E.R.	October 9, 1936
V.	G.W.R.	November 6, 1936
VI.	Irish Railways (other than Gt. Southern)	December 18, 1936
VII.	Minor Railways in Great Britain ...	December 18, 1936
VIII.	Joint Railways in Great Britain ...	December 25, 1936

As our present list deals with the closed branch lines of joint committees, this is an appropriate place in which to refer to a decision of the Railway and Canal Commission, given on July 23, 1931, which provided a useful reminder that it is not a "reasonable facility" to require a railway undertaking to continue maintaining an unprofitable passenger service. The latter arose in connection with the discontinuance of passenger traffic over the branch, about 6¼ miles long, from Winsford & Over station to a junction near Cuddington on the C.L.C. main line. The branch was opened in 1870, closed for passenger traffic from 1873 to 1886, and then again used as a passenger line until 1888. An accident in that year led the Board of Trade to require considerable expenditure in the way of interlocking points and signals before it would allow the line to continue to be used for passenger traffic. Disinclined to face this expenditure, the committee closed the branch to passenger traffic. This led to an application by the Winsford Local Board to the Railway and Canal Commission, which made an order on February 25, 1891, enjoining the Cheshire Lines Committee to afford all due and reasonable facilities for the receiving and forwarding and delivering of passenger traffic upon and from the Winsford branch. Before the line could be re-opened for passenger traffic the committee had to spend £7,500 to satisfy the Board of Trade requirements and from about 1892 until the end of 1930, passenger trains were run along this branch between Cuddington and Winsford. In December, 1930, the committee issued large posters announcing that as from January 1, 1931, the passenger train service between Winsford and Cuddington would be discontinued, and that direct access from Winsford to the main line at Cuddington and at Northwich would be provided by motorbuses. The train service was discontinued on the date named, and buses were introduced by the North Western Road Car Co. Ltd.

In April, 1931, the Winsford Urban District Council made an application to the Court virtually for the re-inforcement of the Order of 1891, while the Cheshire Lines Committee applied later to have it rescinded; the Court took the two applications together. In the course of the hearing some very striking evidence of the expense involved in the passenger service on the branch was given by Mr. S. T. Burgoyne, then Manager of the Cheshire Lines Committee, who showed that between 1924 and 1930 the number of passengers had fallen by 32 per cent., *i.e.*, from over 99,000 to just over 68,000; and ordinary passenger receipts by no less than 54 per cent., *i.e.*, from £1,700 odd to just over £800, while season-ticket receipts had fallen from £117 to £37. Expenditure was reduced from over £5,000 in 1924 to £3,700 in 1930, due chiefly to the fact that in the last two years the passenger service had been maintained by a Sentinel-Cammell steam railcar, which had replaced the ordinary trains, but the necessary expenses of signalmen and station staff had also to be met. Mr. Burgoyne also stated that from January 1, 1923, to that time the four amalgamated railway companies had closed for passenger traffic 82 branch lines, involving a total mileage of 711. In their decision to dismiss the application of the Winsford Council and to rescind the Order, the Commissioners were unanimous, pointing out that it was in the discretion of the Cheshire Lines Committee, having regard to economic conditions, to decide for itself whether it would resume passenger traffic on this branch.

Railway	Section of line (4 ft. 8½ in. gauge unless otherwise stated)	Passenger Service Withdrawn	Section Completely Closed	Remarks
Axholme Joint Line (L.M.S.R. & L.N.E.R.)	Haxey Junction to Goole	July 17, 1933 ...	—	—
Cheshire Lines Committee (L.M.S.R. & L.N.E.R.)	Cuddington to Winsford & Over	January 1, 1931 ...	—	—
L.M.S.R. & L.N.E.R.	Elliot Junction to Carmyllie	December 2, 1929	—	—
Met. & G. C. Joint Committee	Quainton Road to Verney Junction	July 4, 1936 ...	—	—
Severn & Wye (G.W.R. & L.M.S.R.)	Lydney Town to Lydbrook Junction and Cinderford	July 8, 1929 ...	—	—
Severn & Wye (G.W.R. & L.M.S.R.)	Coleford branch	July 8, 1929 ...	—	—
South Yorkshire Joint Line Committee (L.M.S.R. & L.N.E.R.)	Dinnington to Kirk Sandall	December 2, 1929	—	—

Forthcoming Events

1937

Jan. 4 (*Mon.*).—G.W.R. (Birmingham) Lecture and Debating Society, at Great Western Hotel, Snow Hill Station, 6.30 p.m. "R.M.S. *Queen Mary*," by Mr. O. Thery.

Jan. 5 (*Tues.*).—Institute of Transport (Bristol), at Welfare Centre, Bristol Tramway & Carriage Company, 7 p.m. "An Historical Survey of Passenger Road Transport in Bristol," by Mr. R. Pittard.

Institute of Transport (Metropolitan Graduate), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. "Examinations," by Mr. C. Sherrington.

Jan. 7 (*Thurs.*).—G.W.R. (London) Lecture and Debating Society, in General Meeting Room, Paddington Station, W.2, 5.45 p.m. "The Working of Paddington Passenger Station," by Mr. F. Green.

Jan. 8 (*Fri.*).—Institute of Transport (Newcastle), at Royal Station Hotel, 7.30 p.m. "Railroading in British West Africa," by Mr. J. Laing.

Institute of Transport (Newcastle Graduate), at Royal Station Hotel, 6 p.m. "Railway Works Costing Procedure," by Mr. C. Luke.

Institute of Welding (Midlands), at James Watt Inst., Newhall Street, Birmingham, 7.15 p.m. "Electric Resistance Welding with Modern Production Conditions," by Mr. H. Jeffs.

Railway Students' Association (Edinburgh), at Goold Hall, St. Andrew Square, 7.30 p.m. Debate: "That British Railway Commercial Practice Adequately Meets Present Day Requirements." Affirmative: Glasgow Railway Lecture and Debating Society. Negative: Railway Students' Association.

Jan. 11 (*Mon.*).—Institute of Transport (London), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 5.30 p.m. "Some Considerations of Problems affecting Port Management," by Sir Lionel A. P. Warner, C.B.E.

Institute of Welding (Tyneside), at Armstrong College, Newcastle, 7.30 p.m. "Distortion, Residual Stress and Heat Penetration in Respect to Welded Joints," by Mr. H. Martin.

Jan. 12 (*Tues.*).—Institute of Transport (Birmingham), at Queen's Hotel, 6 p.m. "Road Transport of Goods—a National Necessity," by Mr. L. Gupwell.

Institute of Transport (Nottingham Graduate), at Guildhall, 7 p.m. "Accelerated Transits of Merchandise by Rail," by Mr. P. West.

XUM

South Wales Trade Recovery

(*See editorial note on page* 1051)

The South Wales Trade Recovery and Expansion Committee, of which Sir Robert Horne is Chairman, has been at work for some months with the view of suggesting to the Government remedial measures for the alleviation of the distress in South Wales following the decline in the export coal trade and in other local industries. The members of the main committee are as follow:—

Chairman, The Rt. Hon. Sir Robert S. Horne, G.B.E., M.P. (Chairman, Great Western Railway); Deputy Chairman, Sir Stephenson Kent, K.C.B. (Director, Powell Duffryn Associated Collieries Limited. Chairman, Stephenson Clarke & Associated Cos. Ltd., etc.); The Rt. Hon. Lord Aberconway, C.B.E. (Chairman, Tredegar Iron & Coal Co. Ltd., etc.); Sir John Beynon, Bt., C.B.E. (Chairman, T. Beynon & Co. Ltd., etc.); Mr. B. H. Binder (Chairman of Control Board, South Wales District Coal Mines Scheme, 1930); Sir Reginald Clarry, M.P. (Newport); The Rt. Hon. Lord Davies (Chairman, Ocean Coal Co., Ltd. Director, Great Western Railway, etc.); The Rt. Hon. Lord Glanely (Representing shipping interests. Director, Great Western Railway, etc.); Mr. G. H. Hall, M.P. (Aberdare); Mr. Edmund L. Hann (Chairman, Powell Duffryn Associated Collieries Limited, etc.); Mr. Oliver Harris (Secretary, South Wales Miners' Federation); Mr. A. L. Horner (President, South Wales Miners' Federation); Sir Samuel Instone (S. Instone & Co. Ltd.); Mr. Lewis Jones, M.P. (Swansea West) (Secretary, South Wales Siemens Steel Association); Mr. W. North Lewis, J.P. (Chairman and Managing Director, Insoles Limited, etc.); Sir David R. Llewellyn, Bt., J.P. (Chairman, Welsh Associated Collieries Limited, etc.); Sir James Milne, K.C.V.O., C.S.I. (GeneralManager, Great Western Railway); The Rt. Hon. Lord Portal, M.V.O., D.S.O. (Chairman, Special Areas Reconstruction Association. Director, Great Western Railway, etc.); Mr. Miles Reid (Powell Duffryn Associated Collieries Limited); Sir Wm. Reardon-Smith, Bt. (Director, Reardon-Smith Line, etc.); Mr. E. H. Watts (Chairman, Watts, Watts & Co. Ltd., etc.); Mr. L. D. Whitehead, D.L., J.P. (Chairman and Managing Director, Whitehead Iron & Steel Co. Ltd., etc.); Sir Evan Williams, Bt., D.L., J.P. (President, Mining Association of Great Britain, etc.); and Col. Sir Chas. Wright, Bt., K.B.E., C.B. (Chairman and Managing Director, The British Guest Keen Baldwins Iron & Steel Co. Ltd., Director, The Great Western Railway, etc.). The Secretary is Mr. H. E. Hedges.

A bureau for the dissemination of information upon the subject has been set up at Paddington station in charge of Mr. G. E. Orton, the Commercial Assistant to the Superintendent of the Line, G.W.R.

Composition of Sub-Committees

In addition to the main committee, there are four sub-committees to deal with specific subjects, the compositions of which are as follow:—

Sub-Committee "A."—Coal

Sir Stephenson Kent (Chairman); Lord Aberconway; Sir John Beynon; Lord Davies (Mr. L. D. Williams is alternate to Lord Davies); Mr. Jas. Griffiths, M.P.; Mr. G. H. Hall, M.P.; Mr. P. E. Holden (Director and Commercial Manager, Amalgamated Anthracite Collieries Limited, Swansea); Mr. E. L. Hann; Mr. Oliver Harris; Mr. A. L. Horner; Sir Samuel Instone; Mr. W. North Lewis; Sir David Llewellyn; Mr. H. H. Merrett; Mr. Miles Reid; Sir Evan Williams; and Mr. Iestyn R. Williams (Assistant Secretary, Monmouthshire and South Wales Coalowners' Association, Cardiff). The Secretary is Mr. H. E. Hedges.

Sub-Committee "B."—Shipping

Chairman, Mr. E. H. Watts (Watts, Watts & Co. Ltd.); Mr. William Leon (Hall Bros., Cardiff); Sir W. Reardon-Smith (Sir Wm. Reardon-Smith & Sons Ltd.); Mr. J. S. Stranaghan (J. S. Stranaghan, Shipping, Limited); Mr. W. Gibbs (W. Gibbs & Co., Cardiff); Mr. J. C. Radcliffe (Constants (South Wales) Limited); Major C. G. Martyn (Chairman, Shipping Federation, Newport); Mr. G. O. Gibson (Tatem & Co., Cardiff); Mr. J. W. Duncan (J. T. Duncan & Co. Ltd.); Mr. A. R. Watson (Shamrock Shipping Co. Ltd.); Mr. J. T. Clatworthy (Secretary, Cardiff, Newport and Barry Coal Trimmers' Union); Mr. I. A. Ambrose (Ambrose, Davis & Williams Limited); Mr. H. C. Bolter (Evan Thomas, Ratcliffe & Co., Cardiff); Mr. A. J. Popham (Sir Wm. Reardon-Smith & Sons Ltd.); Mr. Geo. Reed (National Union of Seamen); and Mr. W. T. Gould (Walter J. Gould & Co., Cardiff). The Secretary is Mr. W. R. Hawkins, F.I.S.A., Secretary, Employers' Clearing House, Cardiff.

Sub-Committee "C."—Iron, Steel and Tinplates

Chairman, Col. Sir Chas. W. Wright, Bt., K.B.E., C.B.; Major J. M. Bevan, M.C. (Briton Ferry Steel Company); Mr. H. Stewart Craig (Llanelly Steel Company); Capt. H. Leighton Davies; Mr. Charles Keen (Guest Keen & Nettlefold Limited); Mr. John Paton (Partridge Jones & John Paton Limited); and Mr. Lewis Jones, M.P.

Sub-Committee "D."—Other Industries

Chairman, Lord Portal; Sir James Milne; Sir Rhys Williams; Mr. E. L. Hann; Mr. Aeron Thomas; Mr. Arthur James; and Col. G. T. Bruce, C.B., C.M.G., D.S.O. (South Wales and Monmouthshire Trading Estates Limited, Cardiff). The Secretary is Mr. F. Weller.

Text of Memorandum

The following is the text of a memorandum recently issued by the South Wales Trade Recovery and Expansion Committee, setting forth the nature of the situation as this committee sees it:—

"Many of the most important districts of South Wales are scheduled as "special areas." One third of the insured persons in the area have no employment. There are many contributory causes beyond the control of either employers or employed, but the crux of the situation is the virtual collapse of the key industry upon which the major part of South Wales has relied for its support—the export coal trade.

"The committee has very carefully reviewed the whole position, and as anticipated, has come to the conclusion that there can be no satisfactory solution to the South Wales problem until steps are taken to revive the export coal trade.

"The United Kingdom coal shipments as cargo to foreign destinations in 1935 were 15,373,500 tons, or 28·4 per cent. below the average shipments for the four years 1927/1930. The loss to South Wales was 7,369,000 tons, or 48 per cent., a wholly disproportionate amount compared with other exporting districts. It represents a loss of direct employment to over 28,000 men, and indirect employment to over 17,000 men.

"The shipments from South Wales for the current year to the end of September show a further loss of 2,094,000 tons, involving a loss of employment to another 13,000 men.

"The decline in the export coal trade is to a considerable extent attributable to the effects of subsidised foreign competition, particularly by Germany and Russia, and also to barter arrangements and blocked credit transactions. The industry is helpless in such circumstances, and the loss of further markets is inevitable unless Government action is taken. It is obviously its responsibility to take all practicable steps to protect the export trade of the country when put in jeopardy through the action taken by foreign countries.

European Coal Cartel

"The committee considers that the best solution of the South Wales coal problem is the formation of a European Coal Cartel.

"This can be brought about only by the Government clearly indicating its intention of taking all possible steps to regain for Great Britain its fair share of this trade, and by placing in the hands of the industry a weapon in the form of a subsidy through which this object can be attained. This course has been strongly urged upon the Government in a comprehensive memorandum submitted by the committee on November 13.

"Other relevant factors to which the Committee have called attention include:—

"The additional handicap which the export coal trade will experience as from January 1, in consequence of the reduction of approximately 3d. a ton in the rebates receivable from the Railway Freight Rebates Fund.

"The loss of between 250,000 and 500,000 tons per annum in the Canadian anthracite trade, due to the admission of Russian supplies.

Coke Imports

"The importation of approximately 200,000 tons annually of continental coke has been agreed by the Mines Department, although Welsh coal is capable of fulfilling all the functions for which coke is required.

"The depression in the South Wales shipping industry due to the loss of export coal trade, the number of vessels piloted in and out of the principal South Wales ports last year being 50 per cent. less than in 1913. In 1935, 55 per cent. of these vessels were foreign. The number of seafarers employed has been reduced in the same period by 35 per cent., with similar effect upon shore employment, ship-repairing, &c. Government assistance and encouragement is essential to the revival of the industry.

"In consequence of the acute depression in the major industries of South Wales, many of the smaller districts have been virtually driven out of existence. The committee is actively engaged upon proposals for the resuscitation of these industries and for the attraction of new industries to the area."

The South Wales Coal Trade

Mr. C. R. Dashwood, Assistant General Manager, G.W.R., presided at a well-attended meeting of the G.W.R. Lecture and Debating Society at Paddington on December 10, when Mr. Ewart R. Evans, of the Powell Duffryn Associated Collieries Limited, gave a lecture on "Aspects of the South Wales Coal Trade." Mr. Evans gave an indication of the extent of the South Wales coalfield, when he said that its 459 pits covered an area of some 900 square miles, and its output last year was nearly 37 million tons. The men employed in and about the South Wales pits were in excess of 122,000. On the financial side, the total income from coal sold in 1935 was 23 million pounds at the pithead Out of this nearly 15 million pounds was paid in wages and nearly 8½ million pounds in other production costs, with a resultant loss to the coal owners.

The speaker referred to the national value of the export coal trade, which forms a major part of the South Wales coalfield business. In 1913, South Wales produced 4·7 per cent. of the world production of coal; last year the percentage was 3·1. In world markets South Wales suffered competition from coal mined in each of the five continents. In Europe, however, were the principal competitors. Geographical situation was the secret of the strong position enjoyed by some of the European coalfields. Most of the mines of France, Germany, Holland, and Belgium were favourably placed near big industrial areas, from which their product could not be displaced.

The most adverse factor with which the South Wales export coal trade had to contend was that, while Government assistance abroad could be evaluated in shillings a ton, that given to the British coal industry in the form of the railway freight rebate scheme was a matter of pence a ton. In international trade agreements, too, the South Wales coalfield had been unfortunate by comparison even with other British coal producing districts. Mr. Evans gave illuminating particulars of restricted imports and direct and indirect subsidies to the native product that were being applied in various countries abroad. When the extent of Government assistance to foreign coalfields was realised it was no wonder that there was a strong demand, voiced notably by the Chairman of the Great Western Railway Company, that the British Government should come to the aid of South Wales.

Mr. Evans explained the many ways in which the South Wales coal industry was striving to help itself. In the mines, strenuous efforts were being made by the use of machinery for cutting, loading and hauling the coal. At the same time developments were taking place constantly for improving the equipment for sorting and cleaning the coal. These measures, coupled with the fact that Welsh coal was the best in the world, were proving helpful in the struggle to obtain orders in highly contested markets. The speaker made reference to the various heat treatments of coal that were being practised, and explained the almost infinite varieties of by-products that were obtained. He explained the working of the 1930 Coal Marketing Act, and closed with a brief review of the present position and immediate prospects, several factors enabling him to look ahead with a moderate and reasoned optimism.

At the conclusion of his lecture, Mr. Ewart Evans showed on the screen a number of illustrations that supplemented many of the points he had made in his talk.

Social Activities on the French Railways

The big French railway systems are engaged in increasing activities in the realm of social institutions. The running of these institutions is done by social assistants, such as visiting nurses and superintendents, who are as much concerned with the purely social aspect as with the social-medical side.

On December 31, 1935, the French main-line railways had 238 assistants attached to 136 centres. The lines on which these assistants carry out their duties are as follow:—

From the social point of view, they render assistance by giving advice and information to railway staff or their families regarding professions, finding employment, improving housing conditions, and obtaining relief funds. The opportunities thus afforded to interview people in their own homes, and the tact with which they tackle the problems, enable them to render services which are highly appreciated.

From the medical-social viewpoint, their activities comprise collaboration with the medical service of each railway; giving advice on hygiene; the direct application of anti-germ precautions in the home, or directing how it should be done; vaccinating, and helping the doctors and public health officers in their battle against tuberculosis; organising the feeding hours of infants, and giving general assistance to the railway staff and their dependants.

The number of visits recorded at the centres and those made to private homes shows that many new families have taken advantage of this service in the most diverse circumstances. For instance, such varying help has been given as advising on maternal and infant welfare, caring for seriously ill children, and arranging to get them into convalescent homes, guiding scholars, advising adolescents on the choice of a career, obtaining money for extra courses of study or professional instruction, finding or examining dwelling places, giving advice on hygiene and health improvements, and keeping an extra-watchful eye on families with a tubercular tendency. Also they obtain public assistance funds and assist in the matter of life insurance policies.

To show the importance and growth of the results of these activities, it may be noted that the number of families appealing to the Social Assistance Service has gone up from 29,000 in 1932 to 46,000 in 1934, and 53,000 in 1935. The total number of consultations given by this association (in private homes, at the centres and in hospitals) has risen from 247,150 in 1932 to 282,900 in 1934, and 286,300 in 1935.

Apart from these services, certain of the railways have set up, and are setting up at present, social works of various kinds which are much appreciated by the staff. These include inexpensive schools, nursery schools, physical education centres, shower baths, sports grounds, and holiday camps. For a moderate outlay, this plan has been found to give excellent results, both as regards the quality of work and the promotion of a spirit of co-operation.

The main line railways have continued their efforts to popularise the building of cheap houses for their staff. These efforts were hindered in 1934 by the financial depression, which prevented the allocation of sufficient sums of money (such as were available in previous years). Nevertheless, the amount neared 13 million fr., and the corresponding loans in 1934 were consigned to 858 agents, 65 million fr. being divided during 1935 between 1,865 agents, giving an average of 35,000 fr. per agent. The duration of these loans, which depends entirely on the wishes of the borrowers, can be spread over from three to 23 years. The rates of interest, excluding redemption, that these loans bear are from 2½ to 4¾ per cent.

Finally, apart from social works already being carried out, the continuance of which is assured, the French systems give material and moral assistance, as their means permit, to the mutual help societies of their staffs, these being very worthy charities that encourage among the personnel such good qualities as altruism and the spirit of collaboration, as well as an understanding of mutual difficulties. During the course of 1934 a sum of 2,824,705 fr. was thus distributed.

During 1935 about 3,000,000 grants were handed out amongst such associations as the Association Fraternelle des Agents de Chemins de fer Français, the Orphelinat des Chemins de fer, the Sanatorium des Cheminots, the Protection Mutuelle, and various mutual aid societies.

XUM

A Year's Railway Development in China

As is usual at about this time of year, we now review the expansion of the Chinese railway system during the past twelve months. On November 1, 1935, we last dealt with this subject and published a map showing all lines completed up to that date and also those under construction or proposed.

New Lines Opened

On November 20, 1935, the Hwainan Railway, 220 km. in length, was finally completed and opened for goods traffic; opening for passenger working took place on January 1, 1936. The object of constructing this line was to open up the centre of Anhwei Province, and, in particular, to tap the important Lohochien coalfield and carry its output to Yuichekow (or Yuchichen) on the left bank of the Yangtze nearly opposite Wuhu. Actually the formal opening ceremony did not take place until June 5.

Meanwhile the Yushan-Nanchang extension of the Chekiang-Kiangsi Railway had been brought into use just about a year ago. Floods and the incompletion of the Kwangsin Ho (River) bridge at Kueichi (Kweiki) had delayed the opening in the autumn, though the Nanchang-Lientang section had been opened on October 13. The total length now in operation is approximately 639 km. (397 miles).

Early this year the 40-mile extension of the Nanking-Wuhu section of the Kiangnan Railway was completed to Sunchiapu (Ningkuo). Through running between Wuhu and Shanghai via Nanking was established on April 1. About the same time the Peiping-Hankow railway absorbed the Taokow-Chinghua Railway which crosses it at Sinsiang.

An important chord line connecting Soochow, on the Nanking-Shanghai Railway, with Kashing, on the Shanghai-Hangchow-Ningpo system, was opened for traffic on July 15, thus giving a north-south route avoiding Shanghai. Then too, on August 11, the extension of the Lung Hai Railway westwards from Sian was opened as far as Meihsien, a distance of about 70 miles.

Canton-Hankow Trunk Line

By far the most important new line was, however, opened informally for all classes of traffic on September 2, the Canton—Wuchang (Hankow) through route. The overall distance is about 700 miles and the first through train covered it in 45½ hr. It will be remembered from the detailed descriptions and illustrations of the newly-constructed section of this line, published in our issues of March 9, 1934, November 1, 1935 (editorial), and February 7 last, that it traverses difficult mountainous country necessitating long 1 in 100 grades, and heavy tunnelling, bridge- and earth-works.

Finally, the last section of the Pisehtsai (Pishihgai)—Mengtze—Kochiu (Kokiuchang)—Linan—Shihping branch of the Yunnan Railway was completed into Shihping on October 10. The total length of this branch is about 176 km.

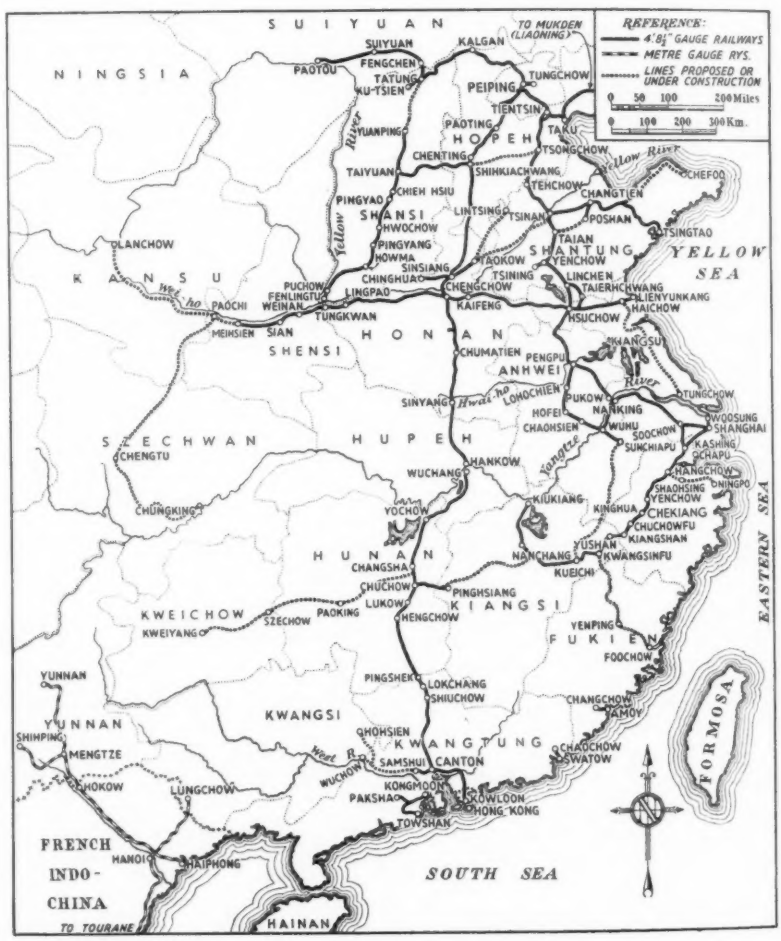
Constructions in Hand

At the same time the construction of a number of other new lines has been begun or continued during the past year. Loans totalling $16,000,000 were arranged at the end of 1935, and sanctioned in June, for the completion of the Shanghai—Hangchow—Ningpo Railway, including the important bridge over the Chien Tang River near Hangchow, the steelwork for which is being supplied by Dorman Long & Co. Ltd. This line was begun some years ago but the various engineering works have until now remained derelict.

The further extension of the Chekiang-Kiangsi Railway west of Nanchang has been in hand throughout most of the year. It will connect up with the Canton-Hankow Railway at Chuchow, thus forming a through rail route between Shanghai and Canton. A heavy engineering work near Nanchang is the bridging of the Kiang River, now in progress. Construction upon the Sunchiapu—Kueichi extension of the Kiangnan railway has also been begun. This line will connect Nanking via Wuhu and Sunchiapu with the Chekiang—Kiangsi line at Kueichi, and thus give direct connection between Nanking and Canton, when it and the Nanchang—Pinghsiang section towards Chuchow are completed, possibly in about a year's time. Canton—until this year entirely isolated in as far as inland communications were concerned—will then have trunk railways to Peiping (via Hankow), Shanghai (via Hangchow), and Nanking. The Lung-Hai Railway western extension beyond Meihsien is also being pushed forward, and work has begun on the Whampoa Harbour extension of the Canton—Hankow line near Canton.

Lines being Surveyed or Proposed

The most important lines at present being surveyed with a view to early



Sketch map of China showing all railways opened prior to November last, and also all new lines under construction, being surveyed or proposed, with reasonable likelihood of construction

construction are the Hunan—Kweichow, the Lung-Hai Railway extension to Chengtu, and the Chungking-Chengtu Railway; the alignments of all three have been provisionally selected. The Hunan—Kweichow line has to cross the Siang River soon after leaving the Canton-Hankow Railway near Chuchow, and this crossing will necessitate the third longest bridge in China. Thence it will proceed via Siangtan (Hsianghsiang) Paoking, and Szechow, to Kweiyang, the capital of Kweichow, with the idea of its being carried on eventually to Yunnan.

The Lung—Hai extension to Chengtu will leave the parent line at Paochi and strike southwestwards over the Tiensha Pass into the comparatively open country leading to Chengtu. The Chungking—Chengtu line, connecting Chengtu with the Yangtze, has been projected for many years, but has now been re-surveyed, a new route being selected, and, with the aid of French capital, is soon to be built. Thus Chengtu, the capital of Szechwan—one of the richest provinces in coal and other materials—may soon be given connections with both northern and southern China.

The Kwangsing (on the Chekiang-Kiangsi Railway)—Yenping section of the proposed line to Foochow, in Fukien, has been surveyed, as have also lines from Samshui (near Canton) to Wuchow (in Kwangsi), from Tsinan to Tungchang (in Shantung), Taokow to Taming (in Hopeh) and Pochow to Kweiteh (in Honan). An important east-to-west connection running from Wuyi (near Pukow and a station on the Tientsin-Pukow Railway) to Luchow (Hofei) (on the Hwainan line), Yehkiatsi and Sinyang (on the Peiping-Hankow Railway) is also proposed, and part of it is being surveyed.

Great bridges over the Yangtze, between Hankow and Wuchang, and over the Yellow River to connect the Tatung—Taiynan—Puchow and Lung-Hai systems near Tungkwan, are projected, as also is an extension of the Peiping-Suiynan Railway to Wuynan and several small lines. As many of these lines, both under construction and projected, are several hundreds of miles in length, there is likely to be a continuance of great railway constructional activity—requiring very large quantities of equipment—for many years to come, despite possible political upheavals in parts of this vast country.

CONTRACTS AND TENDERS

The Associated Equipment Co. Ltd. has received an order from the London Passenger Transport Board for one Matador goods vehicle.

Saxby & Farmer (India) Limited has received an order from the Indian Stores Department for 50 single-line token instruments.

Siemens (India) Limited has received an order from the Indian Stores Department for 10,560 yards of 660-volt four-core and 7,040 yards of two-core cable, and 500 cable boxes.

The Chloride Electrical Storage Co. Ltd. has received an order from the Indian Stores Department, Calcutta, for two sets of accumulators.

Tubes Limited has received an order from the Egyptian State Railways Administration for steel tubes to a total value of approximately £240 (Ref. No. E.S.R. 17.158, delivery f.o.b. English port).

The Egyptian State Railways Administration has placed orders for cables with Kabelwerk Duisburg A.G. and Suddeutsche Kabelwerke A.G. to total values respectively of £4,338 and £1,281. (Ref. No. E.S.R. 330G3/4.)

Deutsche Getreibe G.m.b.H. has received a further order for 26 Mylius mechanical transmissions required for railcars under construction by Ganz & Company for the Roumanian State Railways. Already, 63 sets of Mylius transmissions have been used in conjunction with Ganz engines on the Roumanian State Railways. Mylius transmissions have also been ordered for the four double-engined 440-b.h.p. railcars and one reserve power bogie under construction by the Maschinenfabrik Augsberg-Nürnberg for the Lithuanian State Railways.

Tenders are invited by the Superintendent of Stores, South Indian Railway, Negapatam, receivable by January 11, for the supply of vacuum brake fittings, consisting of steel clips and universal couplings, diaphragm and hose pipes, joint packing and rolling rings and washers, and canvas sleeves.

The South African Railways & Harbours Board has recently placed the following orders :—

Colville's Limited, Fishplates (Ref. B8428/1, total price, £46,320).

Usines Gilson, Fishbolts (Ref. B8428/2, total price £5,425).

August Thyssenhutte, Fishbolts (Ref. B8428/2, total price £711 17s. 6d.).

Stahlunion Export G.m.b.H., Gauge clips, to be manufactured by Kleineisen & Schraubenfabrik Stub. (Ref. B8488/2, total price £212 10s.)

Electric Locomotive Enquiry

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Electrical Section), New Delhi, receivable by February 25, 1937, for the supply of one electric passenger locomotive of type 1-AAA-2 Class EA/2 or 2-AAA-2 Class EC/2, or similar, conforming to the relevant G.I.P. Railway standard and specifications and I.S.R. Specification No. Revised 9/1931. Copies of the I.S.R. Specification can be obtained from the Director-General, India Store Department, London, and tracings of drawings may be seen at Hodges, Bennett & Co. Ltd., 16, Victoria Street, Westminster, London, S.W.1. Tender forms can be obtained from the Director-General, India Store Department, London.

Nasmyth Wilson & Co. Ltd. has received an order from the Bengal-North Western Railway for six 2-6-2 tank locomotives to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

The Assam-Bengal Railway Administration has placed the following orders for locomotive boilers, to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton : Nasmyth Wilson & Co. Ltd., one superheated boiler for YD2 class locomotive ; Vulcan Foundry Co. Ltd., one superheated boiler for YD1 class locomotive.

The L.N.E.R. has placed contracts with several timber merchants in Scotland for 51,000 Scots fir sleepers. This quantity is enough to lay approximately 25 miles of line.

C. A. & A. E. Hayward has received a contract from the L.N.E.R. for the new decorative iron barriers and gates which are to replace the existing wooden platform barriers at King's Cross station.

The Drewry Car Co. Ltd. has received a further repeat order for two standard 0-4-0 type diesel locomotives required for the Eagle Oil & Shipping Co. Ltd.

The Baldwin Locomotive Works has received an order for two locomotives for the Guayaquil & Quito Railway says a Reuters Trade Service message from Philadelphia. The locomotives will be built for unusually difficult operating conditions, the gradient on about thirty miles of the railway being 5.5 per cent.

WAGE CUT RESTORATION IN CANADA.—Canadian railway employees are endeavouring to bring to an end the wage cut of 10 per cent. to which they agreed in 1931. Speaking before the Conciliation Board, Mr. H. B. Chase, the workers' representative claimed that cuts affecting 100,000 employees had saved the C.N.R. and C.P.R. a total of $91,000,000 in five years. Citizens of the United States employed on the sections of Canadian railways on U.S.A. soil were paid full union wages, but this concession had been refused to Canadian employees in Canada. Arguing that the railways were now in a position to restore the cuts, Mr. Chase said that the unions might be obliged to call a strike vote if their requests were not conceded. He stated also that 83 per cent. of the common stock and 99 per cent. of the preferred stock of the Canadian Pacific Railway was held by persons living outside of Canada.

XUM

RAILWAY AND OTHER REPORTS

Assam Railways & Trading Co. Ltd.—The directors have declared the dividends on the pre-preference A shares and the new 6 per cent. preference shares for the half-year ending December 31, 1936, payable on January 4.

Argentine Great Western Railway.—Announcement is made of the payment of interest of 2½ per cent. on the 5 per cent. debenture stock on account of arrears, and at the rate of 4 per cent. per annum on the 4 per cent. debenture stocks.

Trans-Zambesia Railway.—Net receipts for 1935 amounted to £39,466, against £31,026 in 1934. The 1935 figures include the results of working the southern approach to the Zambesi Bridge for the period from September 1. The revenue account shows that the amount due from the Nyasaland Government to cover debenture and note interest, &c., under the guarantee is £72,892, which has since been received. The corresponding amount for 1934 was £82,894. The working expenses for the year, including the southern approach, the river service, and the amounts charged to renewals, amount to 69·64 per cent. of the gross receipts, compared with 75·41 per cent. in 1934. Total tonnage carried during the year was 64,454 tons, compared with 62,384 tons during the previous year. The southern approach and the Zambesi Bridge were declared open for public service by the Portuguese authorities as from October 14, 1936.

Gedaref Railway & Development Co. (Sudan) Ltd.—The report for the 12 months ended October 31, 1936, states that the Kassala-Gedaref-Makwar Line, which forms part of the main railway system in the Sudan, has been operated for passenger and goods traffic throughout the year by the Sudan Railways, acting as contractors to the company. The obligations of the Sudan Government under the sale agreement in respect of the payment of the instalments of the purchase price of the works have been duly fulfilled. These instalments are sufficient to cover interest on the debenture stock, the payment for the redemption of the debenture stock during the year, and all other expenses incurred by the company.

East Yorkshire Motor Services Limited.—Controlled jointly by the L.N.E.R. Company and Tilling & British Automobile Traction Limited, this company secured a total revenue of £274,744 (against £263,844 for 1934-35) for the year to September 30, 1936. The balance, after deducting expenses and depreciation, is £43,709 (against £45,406) and adding £9,159 (against £7,753) brought forward makes a total of £52,868, against £53,159. The directors have again appropriated £20,000 to general reserve, and £24,000 to a dividend of 10 per cent. for the year, leaving £8,868 to be carried forward.

East Kent Road Car Co. Ltd.—The net profit for the year ended September 30, 1936, of this company, which is controlled jointly by the Southern Railway Company and Tilling & British Automobile Traction Limited, was £45,686, against £49,378 for the previous year. After meeting the preference dividends and transferring £10,000 (against £8,000) to general reserve, the directors recommend a payment of 8 per cent. (unchanged) on the ordinary shares, which will leave £7,565 to be carried forward, against £12,879 brought in. From January 1, 1937, the company will operate motorbus services in substitution for the Dover Corporation Tramways. Negotiations for the acquisition of the transport business of the Isle of Thanet Electric Supply Company are in an advanced stage, and it is expected that the tramways will be replaced by motorbuses in the early months of 1937.

English Electric Co. Ltd.—The directors have decided to pay on January 1, 1937, the arrears of dividend on the six-and-a-half per cent. cumulative preference shares in respect of the years 1934 and 1935.

NOTES AND NEWS

Canadian Tourist Traffic.—According to Mr. L. Dolan, chief of the Canadian Travel Bureau, the Canadian tourist traffic during 1936 represented a monetary value to the nation of $275,000,000.

New L.M.S.R. Cargo Steamer.—A new turbine cargo and livestock steamer, the *Slieve Bawn*, for the L.M.S.R. Holyhead-Dublin route, was launched from the Dumbarton yard of William Denny & Brothers Ltd., on December 15.

New Coventry-Michelin Service.—The second of the two Coventry-Michelin pneumatic-tyred railcars has taken up week-day service on the L.M.S.R. lines in the Rugby-Northampton area. Leaving Rugby at 9.42 a.m. it runs to Uppingham, back to Market Harborough, out to Wansford, and returns to Rugby, where it is due at 2.8 p.m. It leaves again at 2.22 p.m. for Northampton (via Market Harborough) and reaches Rugby again (via Long Buckby) at 4.22 p.m. The first of these cars has covered about 10,000 miles.

Two New G.W.R. Halts.—A new halt is to be built by the G.W.R. at Dilton Marsh, a mile and a quarter from Westbury station, on the Salisbury line. The halt will have two 300-ft. platforms provided with shelters and will serve a population of over 2,000 living within half a mile of the line in the villages of Dilton Marsh and Westbury Leigh. A halt is also to be provided at Elson, between Ellesmere and Overton-on-Dee. This will have a single platform and shelter and will serve a population of 550 living in the villages of Elson, Criftins, Eastwick, and Dudleston Heath.

Locomotive Repairs in Heavy Service.—For two and a half years one of the large 4-6-4 express steam engines of the Chicago, Burlington & Quincy Railroad has been assigned to a round trip each day between Denver and McCook on the Aristocrat express. The daily mileage is 510 and the average speed about 45 m.p.h. During this period the engine has shown an availability of 69 per cent. It has been given three general repairs in the two and a half years, and each time a complete set of new tubes and a new firebox tubeplate have been fitted, and on two occasions large portions of the firebox side sheets were renewed.

Black Forest Express to be Instituted.—During the summer months of 1937 a Black Forest Express will leave Victoria at 11 at night and, travelling via Dover, Ostend, Brussels and Cologne, arrive in Baden-Baden at 4.53 the following afternoon and at the town of Constance at 8.35 p.m. The train has been specially timed so that passengers will travel by daylight along the banks of the Rhine, through Heidelberg, and the heart of the Black Forest. In Cologne it will connect with the Rheingold Express for Freiburg, with connections for Titisee. The schedule allows 21½ hours for the outward journey to Constance and 22½ hours for the return journey; the train will include first, second, and third class carriages. The service will come into force on June 25, and will be worked until September 12.

Fatality at L.M.S.R. Bridge in Cumberland.—We regret to report a tragedy that occurred on December 16 at Brigham near Cockermouth during the recent sudden floods. A disused L.M.S.R. branch line here crosses the River Derwent on a bridge at which certain work was in progress, when Mr. R. D. Gauld, Resident Engineer in charge of the work, Mr. A. Riddert, foreman, and two other men were thrown into the river swollen by the floods. The two latter were rescued by onlookers on the bank, but Messrs. Gauld and Riddert were swept away by the very fast current and drowned. Mr. Gauld, who had built up a high reputation in the Engineer's Department, was the author of several articles upon general engineering subjects published at different times in *The Railway Engineer* and THE RAILWAY GAZETTE under the initials "R. D. G."

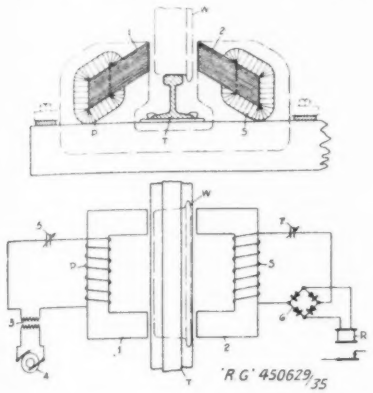
In view of Christmas, this issue is being published three days earlier than usual, and consequently the traffic tables are omitted.

ABSTRACTS OF RECENT PATENTS*

No. 450,629. Apparatus for Detecting the Passage of Railway Vehicles

General Railway Signal Company, of Rochester, New York, United States of America, Assignees of Wade Hampton Reichard, of 74, Colgate Street, Rochester, New York, U.S.A. (*Convention date, January 15, 1935.*)

An apparatus for detecting the presence or passage of a railway vehicle at a particular point along the track

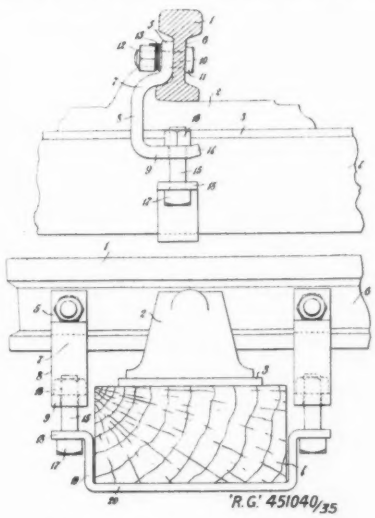


rail comprises two laminated iron cores 1 and 2 disposed on opposite sides of the track rail T. On one core 1 is wound the primary coil P, and on the other core 2 is wound the secondary coils S. The upper edges of these cores 1 and 2 are located as far above the upper face of the track rail as clearances will permit, and the cores 1 and 2 are tilted in order to keep the coils P and S below the upper edges of the cores, the laminations being staggered in order to keep the faces of the cores vertical. The cores 1 and 2 and the coils P and S are supported and housed in a non-magnetic casing fastened to the ties. The primary coil P is energised with a high frequency alternating current, and connected to the secondary of a transformer 3, the primary of which is energised from the alternator 4. The primary coil P also includes a variable condenser 5 which is adjusted with the apparatus in position so that the primary circuits are turned to resonance. The secondary coil S is connected to an electro-responsive device or relay R which is of the usual direct current operated tractive type and is connected to the secondary S through a double wave rectifier 6. The circuit of the secondary coil S is tuned to resonance by an adjustable condenser 7. When no car is present sufficient energy is transferred from the primary P to the secondary S through the inductive coupling to energise the relay R. When a car wheel W comes into position between the pole faces of the cores 1 and 2, the magnetic coupling between the primary P and secondary S is reduced, and the relay R is de-energised owing to the fact that the car wheel, being of magnetic material, tends to shunt the primary flux away from the secondary, the inductive reactance and effective resistances of both circuits are changed, and hence the circuits are detuned thus reducing the voltage and current in the secondary. It should be noted that the relay R is normally energised and that failure of the source of current or breaking of wires will be on the side of safety.—(*Accepted July 22, 1936.*)

No. 451,040. Railway Switch Mechanism

Llewellyn Wynn-Williams, B.Sc., of Haughton Bridge Works, Darlington, in the County of Durham. (*Application date, February 6, 1935.*)

A railway switch mechanism comprises a stock rail 1 mounted upon a slide chair 2 secured to a sole plate 3

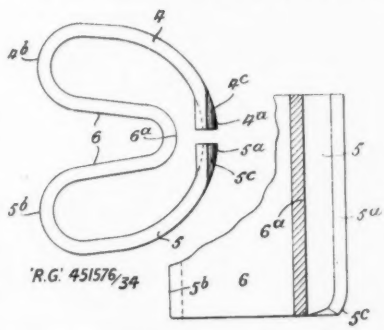


which in turn is arranged upon the top surface of a sleeper 4. Upon one side of the slide chair is a depending bracket secured to the web of the stock rail, and a similar bracket is secured to the stock rail on the other side of the slide chair. Each bracket consists of a metal strip formed with a vertical portion 5, one face of which engages against one side of the web 6 of the stock rail; a portion 7 which extends outwardly, of somewhat arcuate form where it leaves the stock rail; a downwardly extending vertical part 8; and a bottom end part 9 which is bent at right angles so as to lie substantially parallel with the sleeper. That part of the bracket which engages against the stock rail is apertured to receive a bolt 10 which is provided with an oblong head 11 fitting against the opposite side of the web of the stock rail. The bolt projects through the bracket and is engaged by a nut 12 which is secured and locked in position by a plate 13. The bottom end part of the bracket extends away from the downwardly extending vertical part and constitutes a resilient cantilever, the free end 14 of which is bent upwards to constitute a locking plate. This part 9 of the bracket is provided with an aperture through which passes the screw-threaded end of a bolt 15, with which is engaged a nut 16 locked against unscrewing under the action of vibration by the portion 14. The heads 17 of the bolts 15 engage beneath horizontally projecting extensions 18 on a member which is formed of strip steel and is provided with portions 19 extending vertically down the side of the sleeper which are formed with a horizontal portion 20 extending beneath and engaging against the underside of the sleeper.—(*Accepted July 29, 1936.*)

No. 451,576. Keys for Securing Rails on their Supporting Chairs

Executor of James Mills Limited, of Bedbury Steel Works, Bedbury, near Stockport, in the County of Chester, and Allan Macbeth, of "Broadway," The Firs, Bowdon, Altrincham, in the County of Chester. (*December 1, 1934.*)

A key for securing rails to chairs is formed from a piece of steel plate so that upper and lower outwardly-directed wings 4 and 5 are provided, as also an intermediate re-entrant bend 6. The free edges 4*a* and 5*a* of the wings lie at such a distance from the closed side 6*a* of the bend that when the key is driven in between the rail and the chair jaw, the free edges do not, under normal conditions of use, come into contact with the closed side 6*a* of the strut, and the key functions



wholly by spring action. If the space between the rail and the chair jaw should be smaller than that for which the key is really designed, the driving in of the key will cause the free edges 4*a* and 5*a* to contact with the closed side 6*a* of the strut 6, which will then preserve the wings from collapse or

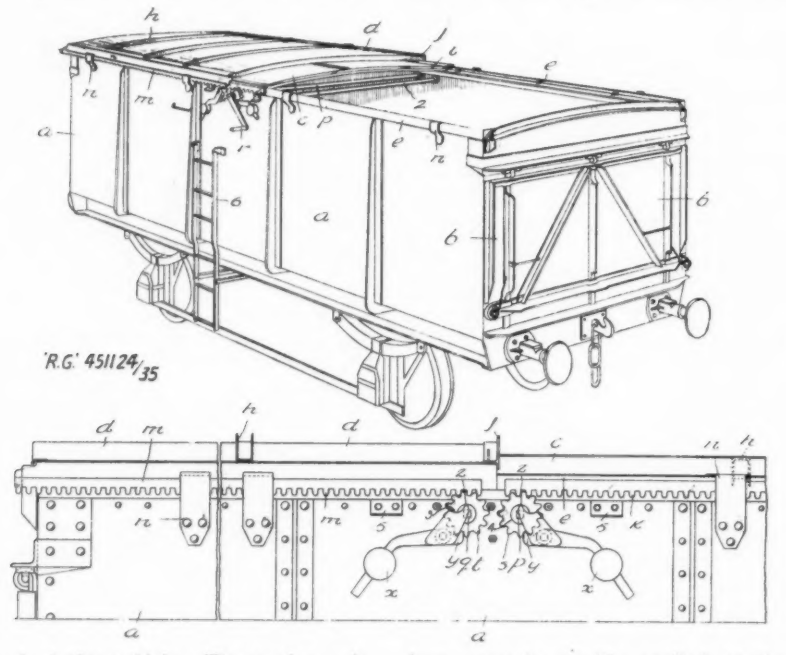
* These abridgments of recently published specifications are specially compiled for THE RAILWAY GAZETTE by permission of the Controller of His Majesty's Stationery Office. Group abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2 either sheet by sheet as issued, on payment of a subscription of 5s. a group volume, or in bound volumes, price 2s. each, and the full specifications can be obtained from the same address price 1s. each.

permanent set. The key is made parallel, both longitudinally and vertically throughout its length, and to enable it to be driven into position the edge of the plate from which it is made that forms the front end of the key may be rounded or bevelled, or the front corners of the free edges 4*a*, 5*a* are cut away or turned inwards as at 4*c*, 5*c* to form a bevel. When the key is placed against the rail before being driven into position, the bends 4*b*, 5*b* may contact only with the fishing angles of the head and foot of the rail, but when the key is driven in, they will also contact with the web of the tail.—(*Accepted August* 14, 1936.)

No. 451,124, Sliding Roofs for Railway Wagons

Metropolitan-Cammell Carriage and Wagon Co. Ltd., of Metropolitan Works, Saltley, Birmingham, and Thomas James, of Neath House, Caruglas Road, Sketty, Swansea. (*Application date, April* 5, 1935.)

An ordinary wagon *a* may have end doors *b* hinged at the top so that the truck may be lifted and tilted to allow discharge of the contents. The roof or cover is made in two sections *c* and *d* capable of being traversed to either

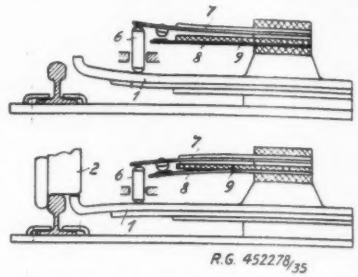


end of the vehicle. The section *c* is always lower with respect to the cant-rails *e* than the section *d*, and can slide under it. The side edges of each roof section are made of angle members *f* and *g*, and the sections are stiffened by cross members *h*. The cross members at the innermost ends of the sections *c* and *d* may be T-section members *i* and *j*. These parts act as stops in conjunction with the ends of the wagon to limit the movement of the sections to the desired position. Secured on the outside of each edge member *f* of the section *c* is a stout longitudinal rack bar *k* with downwardly directed teeth: and similarly on the members *g* of section *d* are rack bars *m*. On the side of the wagon are secured brackets *n* which are curved over the rack *m* to prevent any upward displacement of the section *d*. Two cross shafts *p* and *q* are provided with squared ends to receive a removable handle *r*, while pinions *s* and *t* are secured on the shafts *p* and *q* respectively. The pinion *s* engaging the rack *k* and the pinion *q* engaging the rack *m*. In order to prevent the roof sections moving during tilting, each pinion *s* and *t* is provided with loaded levers *x* with pawl ends *y* engaging the teeth of the pinion. When the lever *x* is lifted its pawl *y* is withdrawn from the pinion teeth and the guard plate *z* is swung away, thus allowing the handle *r* to be applied to the shaft. Both rack shafts *p* and *q* may be encased in sleeves. The guard plates *z* are formed with a curved face 3 which fits into a recess 4 turned in the operating handle boss so as to prevent the latter from slipping. Stop brackets 5 may be provided on the wagon side to prevent the lever *x* being thrown upwardly over its centre by rough handling. A fixed ladder 6 may be secured to the wagon so that the hand lever may be readily applied to the shafts *p* and *q*.—(*Accepted July* 30, 1936.)

No. 452,278. Rail Contact Arrangements

Vereinigte Eisenbahn-Signal-Werke G.m.b.H., of Berlin-Siemensstadt, Germany. (*Convention date, Germany, June* 7, 1935.)

In a wheel-operated spring contact arrangement 1 is the wheel-operated spring assembly which, in the inoperative position, holds a contact spring 7 in the interrupting position through a tappet 6. The counter-contact 8 is constructed as a spring and rests under initial tension against a fixed body 9, in the inoperative position. Contact making due to vibrations is thus avoided. When a wheel 2 travels over the spring 1, the spring 7 is released and forces the spring 8 downwardly, thus effecting a reliable contact closure. As the spring 8 is thus moved away from the fixed part 9, vibrations in



this fixed part have no influence on the contact itself, which is now arranged in suspension.—(*Accepted August* 19, 1936.)

COMPLETE SPECIFICATIONS ACCEPTED

450,725. Bamber, G. T. Means for holding mattresses in position on board ship, in trains, and on other vehicles

450,884. Soc. Anon. des Hauts-Fourneaux de la Chiers. Method and apparatus for tempering rails

451,038. Baker, E. W., and Lamp Manufacturing & Railway Supplies Limited. Railway signal or like oil-burning lamps.

450,514. Books, R., Gray, W. T., and Associated Electrical Industries Limited. Electric traction and like control systems.

451,521. Knorr-Bremse A.-G., Kaiser, W., and Balke, H. Automatic pipe or electric couplings for rail and like vehicles.

451,624. Dyson, J., and Dyson & Co. Ltd., R. A. Road vehicles for the combined road and rail transport of material.

451,787. Jakobs, H. Automatic safety railway car couplings.

451,882. Ablett, C. A., and Kay, S. Axleboxes for vehicles.

451,892. Budd Manufacturing Company, E. G. Railcar trucks.

451,929. National Aluminate Corporation. Method of a material for treating boiler feedwater.

451,961. Soc. Anon. des Laminoirs, Hauts-Fourneaux, Forges, Fonderies, et Usines de la Providence. Apparatus and process for the simultaneous hardening and straightening of railway and tramway rails.

452,172. Tomlinson, A. V. (Union Switch & Signal Company). Railway traffic controlling-apparatus.

452,173. Michelin et Cie. Construction and mounting of axles for road or rail vehicles.

452,244. Torma, S. Automatic central buffer couplings for railway vehicles.

452,263. Gundlach, R. Periscope for armoured endless-track vehicles, motor-cars, railway cars, and the like.

452,341. General Railway Signal Company. Electromagnetic relays.

452,356. Aktiebolaget Svenska Kullagerfabriken. Plain bearings constructed for grease lubrication.

DIESEL Railway Traction

High Spots of 1936

APART from the rapid and consistent development of diesel railway traction in all its phases, which led to totals of over 3,000 railcars, 117 streamlined set trains, and about 1,000 locomotives (exclusive of small tractors) in service, the year 1936 was notable for several events of a sensational or record-breaking character which, in addition to their publicity value, gave some indications of the possibilities of and the belief in this form of motive power.

In the realm of speed was registered the highest velocity yet reached by any railway diesel vehicle, viz. 205 km.p.h. (127 m.p.h.) by one of the Reichsbahn three-car 1,200 b.h.p. trains. In the same category came also the trial run of one of the Chicago, Burlington & Quincy Railroad's Denver Zephyrs, running as an eight-car train instead of the normal twelve. It made the 1,017·4 miles from Chicago to Denver non-stop at an average of 83·3 m.p.h., with a maximum speed of 116 m.p.h. The crop of German diesel schedules of 77-82 m.p.h. was maintained and a further two 77 m.p.h. bookings added by the runs between Berlin and Breslau, one up and one down daily, the 202 miles between the two cities forming the longest diesel non-stop run in Europe. Diesel schedules of 73·2 m.p.h. between Rouen and Havre and 72·0 m.p.h. from Paris to Havre were introduced during the course of the year, and in Italy a tremendous advance was made beginning with the winter timetables by the introduction of numerous schedules of 60 to 69 m.p.h. in the Milan—Bologna—Venice—Bolzano area. Not all of these are yet actually in operation, pending the regular introduction of the Fiat three-car trains, but the 290 b.h.p. Fiat single-unit buffet cars are operating a number of runs up to 67·9 m.p.h. start-to-stop. Towards the end of the year it was announced that early in 1937 another international diesel service would begin, between Paris and Brussels, for which a time of three hours including three stops has been proposed.

In size, just as much as in speed, the year 1936 produced something new, for three locomotives were built in America which are by far the largest single-unit diesel locomotives in existence. The three are to different designs; they weigh 154,152 and 143 long tons respectively, and have starting tractive efforts of 86,000, 102,000 and 96,000 lb. Moreover, the first locomotive is powered by a single engine, the Busch-Sulzer two-stroke type, which develops a continuous output of 2,000 b.h.p. in ten cylinders, or 25 per cent. greater power than the next largest engine. In single-unit railcars, too, advance was made in size and power, culminating in 800 b.h.p. vehicles in the U.S.A. and in the twin-engined 600 b.h.p. vehicles of the P.L.M. Railway in Europe, both types being utilised for heavy trailer haulage. All the locomotives and trains mentioned so far, except those in Italy, have electric transmission, but a decided threat to the superiority of this form for medium powers and fast services was made during the year by the introduction of gearboxes transmitting 400 and 500 b.h.p. continuously and 550 b.h.p. as a maximum. Both types, Fiat and Renault, are used in conjunction with engines running at 1,500 to 1,700 r.p.m., but this is just the type required for fast trains and railcars, where weight is of much importance.

Argentina, ever a land devoted to diesels, made such progress during 1936 as to leave little doubt that oil engines will form the future motive power of most lines in that country. The State lines introduced 34 Ganz cars on their metre, standard and broad gauge tracks, and already are contemplating the purchase of a further 50 oil-engined railcars. The well-known Buenos Ayres G.S. Railway, after ordering seven small cars for its own lines and 10 articulated cars for its associate, the Buenos Ayres Midland Railway, finished the year by ordering no fewer than 99 bogie railcars of 100 b.h.p., all similar as regards motive power, transmission, bogies and chassis. Forming by far the largest railcar order ever placed in Britain, this contract is valued at approximately £400,000. Quantitatively it has been exceeded only once in the world, viz. by the 100 Fiat cars of 160 b.h.p. ordered in 1935 and delivered by the end of 1936, but in monetary value it has been almost equalled in America by such contracts as those for the two 3,000 b.h.p. 12-car Denver Zephyrs. In Europe the price of the 40 Dutch triple-car trains would be more than double the value of the Argentine contract, but the order was split up over several builders. But an interesting point about the Argentine cars is that all of them are to have Gardner engines, and the order came just two years after the Gardner firm and their Belgian licensees received an order for 100 engines for installation in railcars belonging to the Vicinaux railways.

Locomotive applications, while relatively few in number, were of some technical interest. In Britain, the 20 L.M.S.R. oil-electric shunters provided a good starting ground for an extensive use of such machines in future, but in their general features they contained little that was new, having been tried out thoroughly first by means of the Armstrong-Whitworth 250, b.h.p. and English Electric 300 b.h.p. locomotives. On the other hand, the locomotive of the L.M.S.R. Northern Counties Committee had several features unusual in Britain, including a 350 b.h.p. two-stroke engine and hydraulic transmission with two sets of mechanical gearing.

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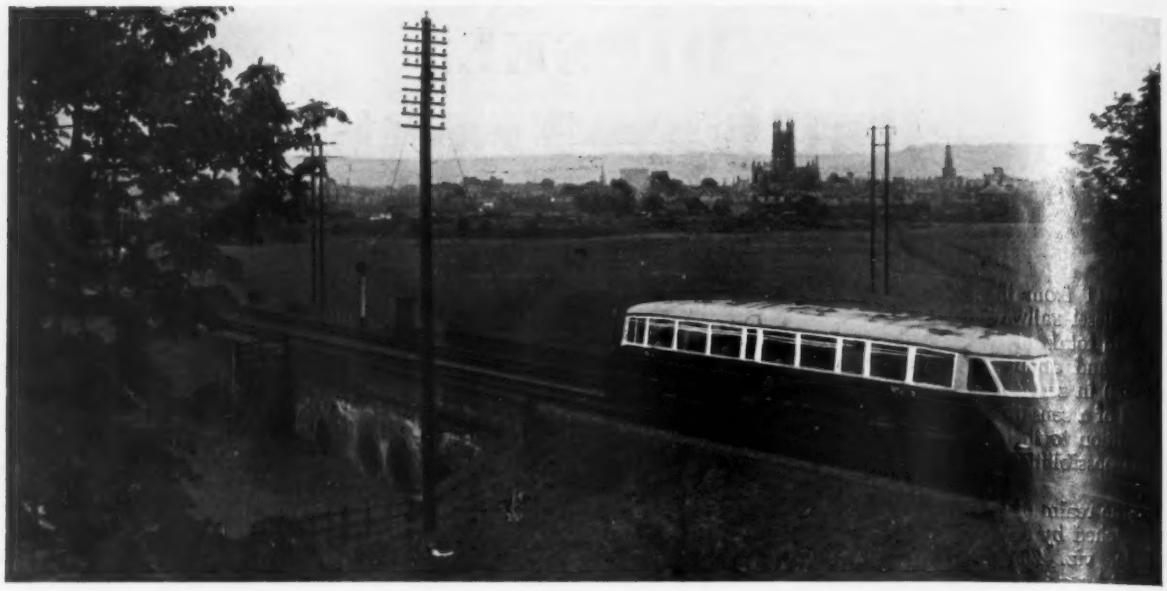
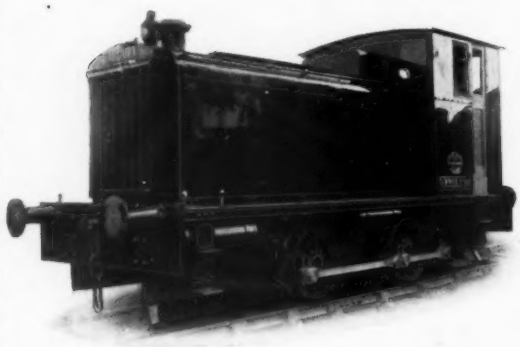


The Great Western Birmingham—Cardiff A.E.C. buffet car on the outskirts of Gloucester

British Boom in Diesel Traction

GREATLY EXTENDED LOCOMOTIVE AND RAILCAR SERVICES

IMPORTANT events in the application of locomotives, railcars and trains made 1936 the most notable year in the history of the oil engine as used by British and Irish railways, and while the number of units being built at the end of the year was not so large as it was 12 months previously, it is probable that further orders for shunting locomotives will be placed ere long by the biggest British railway, and that continued activity will be shown by other lines.



160 *b.h.p. Barclay locomotive for War Office*

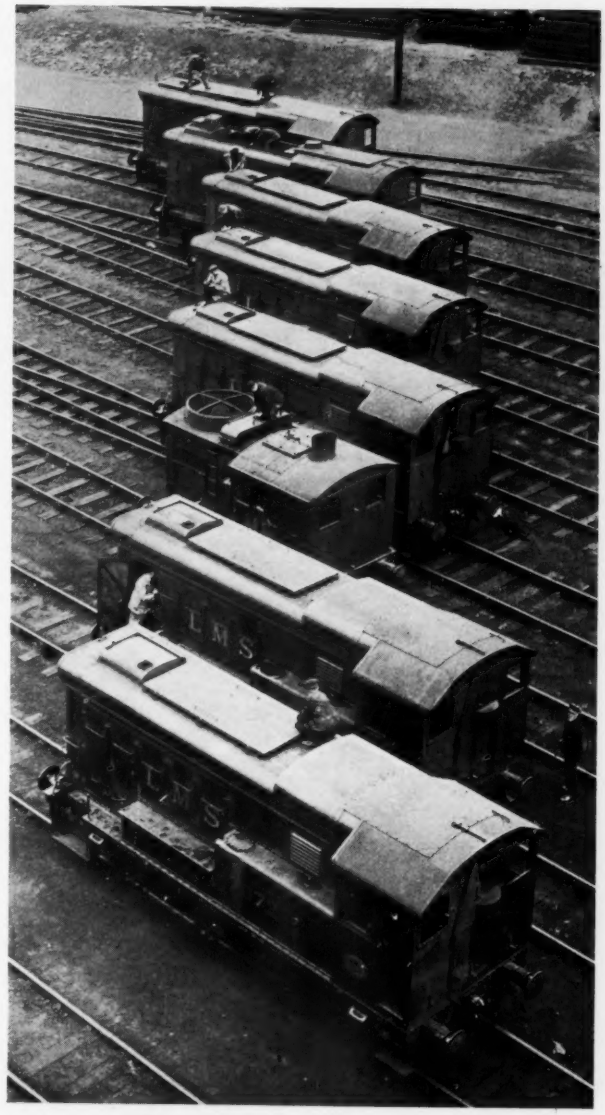
The 20 heavy oil-electric shunting locomotives of the L.M.S.R. were put into service between February and July, delivery commencing about 15 months after the order was placed. Although of two different makes, all these locomotives are of similar power and operating characteristics, but the Armstrong-Whitworth ten have a single traction motor with a jackshaft and rod drive, whereas the English Electric ten have two nose-suspended motors with coupling rods to transmit the torque to the middle axle. Both types have a weight of 50-51 tons, a maximum speed of 22 m.p.h., a starting tractive effort of 30,000 lb., and a continuous engine output of 350 b.h.p., the Armstrong-Sulzer engines running at 875 r.p.m. and the English Electric engines at 680 r.p.m. The total fuel capacities of 500 and 635 gal. are sufficient for a normal week of 24 hr. shunting. Westinghouse brakes with self-lapping control and quick release assist in providing efficient and rapid shunting movements. Another L.M.S.R. activity during 1936 was to have a Cotal electro-magnetic epicyclic gearbox fitted to one of the earlier 150 b.h.p. diesel-mechanical shunting locomotives, the original transmission of which was not entirely satisfactory. The construction of a three-car oil-engined train was begun at Derby works. It is to be fitted with four Leyland 130 b.h.p. engines operating in conjunction with four sets of Leyland partial-hydraulic transmission.

Eleven of the double-engined 260 b.h.p. A.E.C. railcars were delivered to the Great Western Railway, and this completes the order placed after it was recognised that the Birmingham—Cardiff buffet cars had characteristics and capabilities which could be utilised over many routes. Of the 18 cars now in the stock list 17 have two engines, and of these one is devoted entirely to parcels and light goods traffic in the Thames valley, and another, the last car to be delivered, has its chassis and transmission arranged for trailer haulage, whereas the other 17 vehicles work solo. According to the winter timetables the first 17 cars maintain a total mileage of 3,618 over a route mileage of 742, the maximum daily distance per car being 402 miles. The fastest schedule is 18 min. for the 19¾ miles from Castle Cary to Westbury, equivalent to a start-to-stop speed of 65·8 m.p.h., and this despite a maximum speed with normal engine revs. of 75 m.p.h. Normally, spare cars are held at Birmingham, Worcester, Newport, and Bristol, and, as under the regular maintenance scheme carried out by the Associated Equipment Company, each car is withdrawn for examination

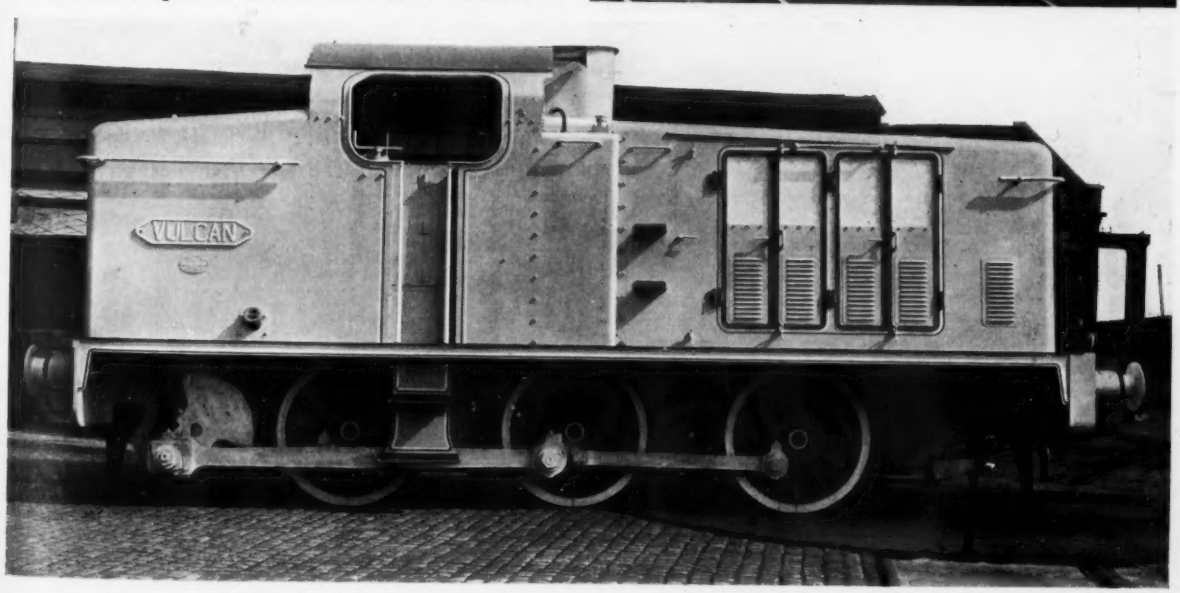
every 25,000 miles, one car is generally out of service for this purpose, giving a total of at least 13 cars always in actual operation.

A shunting locomotive of the English Electric 350 b.h.p. type also was acquired by the G.W.R. and it is virtually a duplicate of those working on the L.M.S.R. The Southern Railway decided to test the merits of diesel shunting and to that end ordered three complete sets of power and transmission equipment of English Electric manufacture for installation in three mechanical portions now being built at Eastleigh works. A new design of shunting and mixed local traffic locomotive was built by the Vulcan Foundry and placed in experimental service. It has a 275 b.h.p. engine, a five-speed Wilson epicyclic gearbox, and a Vulcan-Sinclair fluid coupling. The drive from the gearbox is through a reverse box and a double reduction gear to a jackshaft (carried on Ransome & Marles roller bearings), and thence by rods to the wheels. The maximum tractive effort is 20,300 lb. up to 4·5 m.p.h., and on the top gear step, 2,000 lb. at 46 m.p.h. Other big British shunting locomotives of 1936 were the two Air Ministry locomotives with 160 b.h.p. Gleniffer engines, Wilson gearboxes and Vulcan-Sinclair fluid couplings built by Andrew Barclay; the 180 b.h.p. Paxman-engined locomotive built by the same firm for Imperial Chemical Industries; and the 204 b.h.p. locomotive built by the Hunslet Engine Company. The last-named locomotive incorporates the first application of a Gardner 204 b.h.p. engine to railway work.

Extremely interesting events took place in Ireland during the year. They included the inauguration of intensive diesel-worked suburban services out of Dublin and Belfast on the Great Northern Railway, with two triple-car 150 b.h.p. Gardner-engined trains each seating 8 first class, 50 second class, and 101 third class passengers; the construction of a big double-bogie 260 b.h.p. car with Leyland engines and partial-hydraulic transmission for trailer haulage out of Belfast on the Northern Counties Committee system; and the delivery by Harland & Wolff of a 350 b.h.p. locomotive with Voith-Sinclair hydraulic transmission to the Northern Counties Committee.



Right: A batch of the L.M.S.R. diesel-electric and diesel-mechanical locomotives



Below: 275 b.h.p. Vulcan diesel-mechanical locomotive

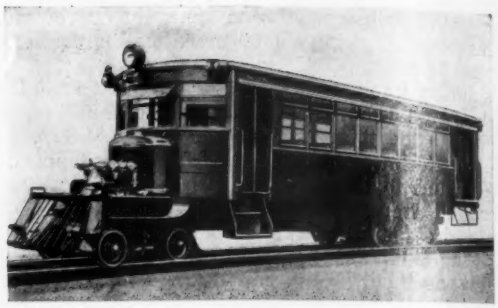
British Exports

NEW ORDERS FAR EXCEED SHIPMENTS

DESPITE the large volume of work in hand at the beginning of the year shipments of British-built diesel vehicles were disappointing. Certain units have been on order for over two years and as time goes on the possibility of delivery seems to become more remote, for to the causes which prevented completion within a reasonable period must now be added armaments activities. A thorough revision of British methods in dealing with the completion of the larger sizes of vehicle and engine is necessary; while procrastination is permitted here foreign firms are stepping in and taking work which had been virtually assured for Britain, the latest example being the railcar order placed with Ganz by the Buenos Ayres Pacific Railway.

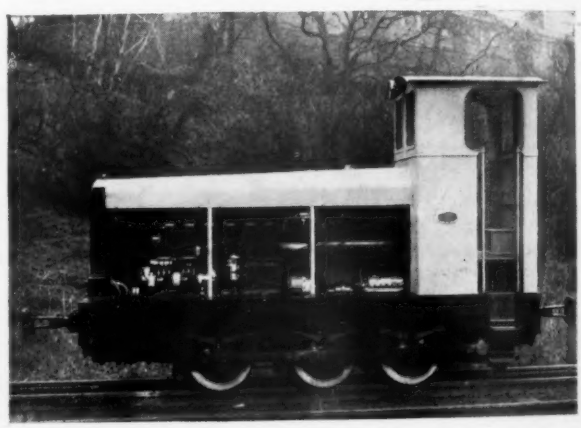
In the locomotive field, 350 b.h.p. shunting locomotives were supplied by the English Electric Company to the Sudan Government Railways (2); to the South African properties of the New Consolidated Goldfields (3); and by Armstrong-Whitworth to the B.B.C.I. Railway (1). The South African delivery was of interest because a seventh cylinder was added to the standard six-cylinder 350 b.h.p. engine, giving a nominal output of 410 b.h.p., but as these units operate 6,000 ft. above sea level the actual output is only 320 b.h.p. The mechanical portions of all the English Electric locomotives were built by Hawthorn-Leslie.

In the smaller range, W. G. Bagnall Ltd. shipped two 70 b.h.p. Gardner-engined locomotives with two-speed gearboxes to West Africa, and also exported a 120 b.h.p. Deutz-engined locomotive with a four-speed gearbox, the engine in this case being of the three-cylinder two-stroke type running at 450 r.p.m. Several of the small 50 and 74 b.h.p. Gardner-engined Drewry locomotives were supplied as repeat orders to the Eagle Oil Company, and six were sent to New Zealand; Hudswell Clarke built some 60 b.h.p. Paxman-engined locomotives for New Zealand; the Hunslet Engine Company shipped numerous 20-60 b.h.p. units to Africa, Iraq, India and the East; and several Fowler locomotives of 50 to 80 b.h.p. and of 12 to 22 tons weight were sent abroad. Eight Hibberd locomotives with 65 b.h.p. Paxman and Blackstone engines and Freeborn gearboxes were sent to West Africa.

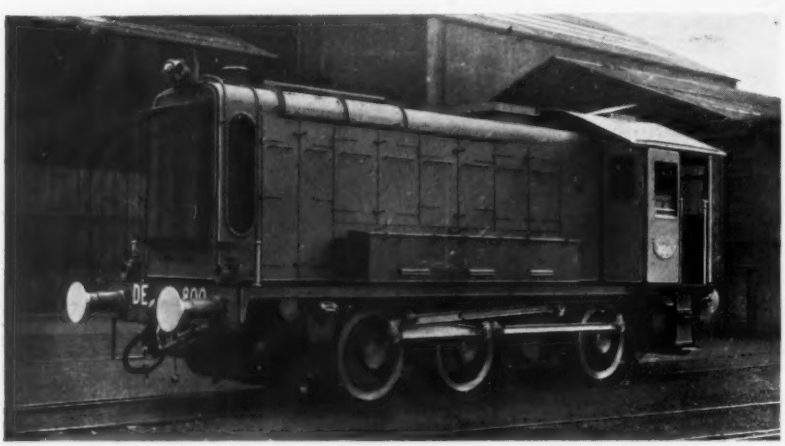


Railcar in Cuba powered by 68 b.h.p. Gardner engine

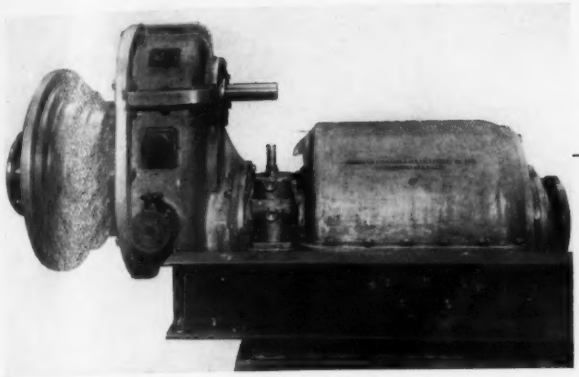
Complete railcars exported from the British Isles were limited to the 102 b.h.p. Gardner-engined car supplied to the Peruvian Corporation, but railcar components, such as the Leyland 95 b.h.p. oil engine and hydraulic transmission for the New Zealand Government Railways, helped the position a little. At long last some of the Harland-B. & W. 360 b.h.p. two-stroke engines, with their attendant Voith-Sinclair hydraulic transmission, have been shipped to New South Wales, where they are to be installed in powerful railcar trains. Gardner engines of 68 b.h.p. have been installed by the United Railways of Havana in one or two of their small American Mack railcars, which have been rebuilt and the original petrol engines replaced.



Above: One of the Drewry diesel mechanical locomotives exported to Mexico



Left: 350 b.h.p. Armstrong-Whitworth oil-electric shunting locomotive for the broad-gauge lines of the Bombay, Baroda & Central India Railway. It has an Armstrong-Sulzer engine, Crompton-Parkinson electrical equipment, Vokes air filters, and Serck radiators



Voith-Sinclair hydraulic transmission and gearing

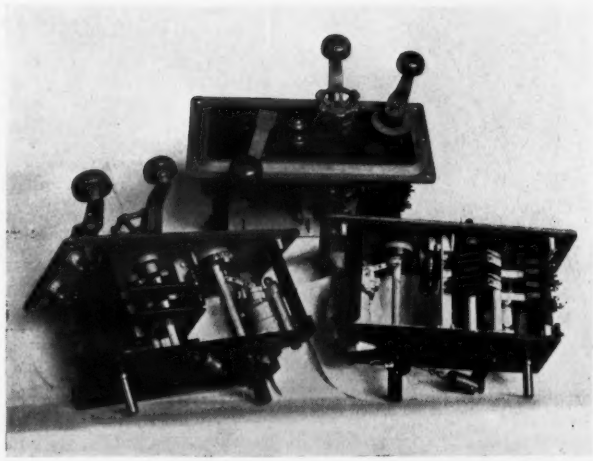
Transmissions

MECHANICAL, HYDRAULIC AND ELECTRIC SYSTEMS SHOW SIGNS OF STANDARDISATION

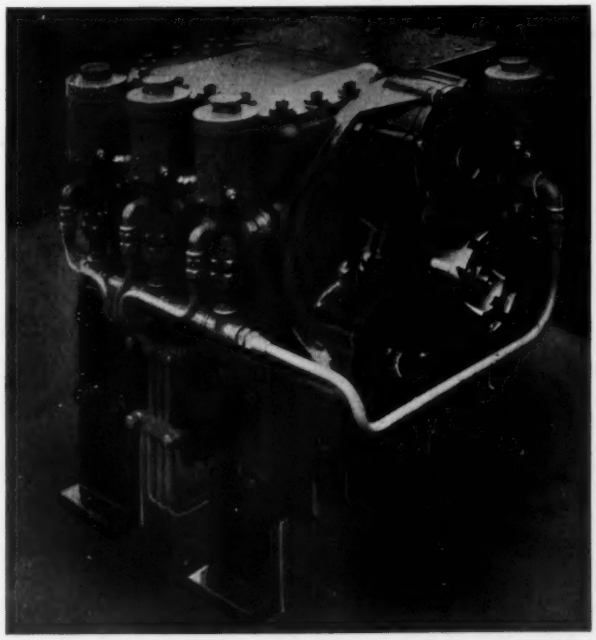
THE year has been one of exceptional interest in the field of transmission, for although few notable experiments have been made there has come the first indication of something approaching standard arrangements. For example, among British-built railcars a Wilson epicyclic gearbox and a Vulcan-Sinclair fluid coupling have been specified for so many installations (culminating in the 99 Drewry cars for Argentina) that the combination can be regarded as one of the standards. Actually, 24 Wilson boxes from 72 to 300 b.h.p. have been supplied for locomotives during the past 12 months, and 26, varying from 130 to 300 b.h.p. for railcars, and orders have been received for many more.

In a similar fashion, Mylius and SLM-Winterthur mechanical transmissions have been applied in large numbers to a great variety of engine makes, and 75 sets of the latter were supplied in 1936 including the installations on the French "standard" cars. Almost 700 sets of Mylius transmission are now in operation or on order, including powers of 300 b.h.p. and upwards in Roumania and Germany, and an order for 50 four-speed boxes for use with 150 b.h.p. engines was placed by the Reichsbahn during the year. High-power mechanical transmissions of other designs applied during the year included the four-speed Renault box used in conjunction with 500 b.h.p. engines of the same make in French trains and cars, and the four-speed Fiat boxes transmitting a continuous output of 400 b.h.p. at 1,700 r.p.m. engine speed and a maximum of 550 b.h.p. at 1,800 r.p.m., as installed in the new Italian trains. Minerva gearboxes, hitherto used only in France, were introduced into Africa during the year; Ganz boxes were applied in Hungary, Roumania and Argentina; and, after lengthy trials, the new Maybach preselective box with six to eight speeds has been put on the market. The Cotal box has made its first working appearance in Britain on one of the L.M.S.R. diesel shunters, and the use of the Ardelt box has been extended.

Partial hydraulic systems on the Voith-Sinclair and Lysholm-Smith principles continued to make progress. The illustration at the head of this page shows the Voith-Sinclair unit fitted to the N.C.C. locomotive with a 350 b.h.p. Harland-B. & W. engine; this torque converter was designed to transmit 294 h.p. at 2,005 r.p.m. and 329 h.p. at 2,080 r.p.m. The use of this system has been extended in Germany for railcars and loco-tractors. The VSG form of Lysholm-Smith hydraulic transmission has been fitted to the latest Queensland cars, and the Leyland form to the powerful cars of the N.C.C. and to vehicles in New Zealand and South America. Electric transmissions of the normal types were applied to railcars and high-speed trains, but the Gebus type appears to be obsolete while the Asea, Jeumont, and RZM systems have advanced.



Controller used for Mylius transmissions with two engines and boxes driven from one position



Latest type of Wilson gearbox arranged for multiple-unit control

Two of the standard-gauge 240 b.h.p. Ganz railcars, Argentine State Railways

SOUTH AMERICA

Consolidates Diesel Situation

THE large volume of business placed by Argentine railways during the current year, despite mixed successes and very considerably delayed deliveries of earlier vehicles, shows in no uncertain fashion that whatever faults and disadvantages diesel units may have, they are far outweighed by the advantages for such railways as are found in South America. A total of 35 railcars was delivered to South America in the course of 1936, and orders were placed for 113 single-unit railcars, 17 trains and articulated cars, and 4 locomotives. In addition, work is proceeding on 21 cars, some single-unit and some articulated, which were ordered in 1934 and 1935.

Of all railways, the Buenos Ayres Great Southern is the best friend of diesel manufacturers. With its associates, the Buenos Ayres Western and Buenos Ayres Midland Railways, it placed orders for 106 single-unit cars, 10 articulated cars, and 4 locomotives, to add to the existing diesel stock of 5 mobile power-houses, 4 locomotives, and 4 railcars. The single-unit cars were ordered in two groups, the first consisting of seven bogie cars to seat 40 passengers each along with mail and baggage accommodation, and the second of 99 bogie cars with four different body arrangements. Both orders were booked by the Drewry Car Company and all the vehicles will be built at the Preston works of the English Electric Company. A standard power unit comprises a 102 b.h.p. Gardner 6LW engine, a four-speed Wilson epicyclic gearbox, and a Vulcan-Sinclair fluid coupling. The underframes and bogies will be standard over the whole range, and Timken roller bearing axleboxes will be used throughout. Large though the order for 99 cars is, it is not the biggest diesel car order ever placed; that distinction belongs to the 100 Fiat oil-engined Littorinas ordered by the Italian State Railways in 1935. In this instance the number was only one more but the cars were somewhat larger, although not heavier, and were powered by two 80 b.h.p. Fiat engines. The cars of the latest Drewry order are estimated to tare about 21 tons and will have a top speed of 50 m.p.h. The contract price was about £400,000.

The ten articulated cars for the Buenos Ayres Midland Railway also are to be powered by Gardner engines, two 6LW engines to each rake, and with Wilson four-speed gearbox and Vulcan-Sinclair fluid coupling. Two of these rakes are intended only for light goods and poultry traffic. These vehicles are being built by the Birmingham Railway Carriage & Wagon Company, at whose Smethwick works railcars are under construction for the Entre Rios, Central Argentine, and Buenos Ayres Pacific Railway. All the B.A.G.S. and B.A.M. cars detailed above are for the broad gauge and this applies also to the four oil-electric locomotives on order for the B.A.G.S. Two of these are being built by Harland & Wolff and will be powered by two 900 b.h.p. two-stroke engines; the other two are the 1-Co-1 units of Armstrong-Whitworth build which

880 b.h.p. oil electric locomotive to be shipped by Armstrong-Whitworth to the River Plate for service on the broad-gauge lines of the Buenos Ayres Great Southern Railway

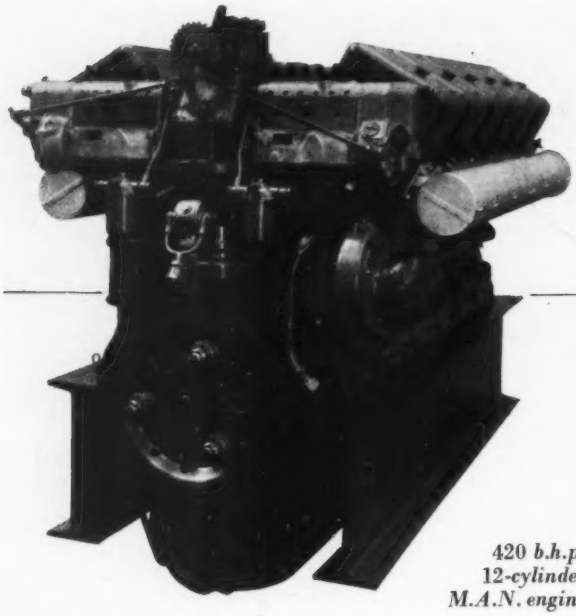
were tried out on the Ceylon Government Railways; they are now being reconditioned at Scotswood works. They have 800 b.h.p. Armstrong-Sulzer engines and 80 b.h.p. Armstrong-Saurer engine-generator auxiliary sets.

Near the end of 1936 the Buenos Ayres Pacific Railway ordered from Ganz six sets of engines, mechanical transmissions, bogies and chassis for double-bogie railcars, and contracted for the design and part supply of the bodies. This increases the Ganz influence in South America, for the big event in Argentina during the year was the introduction on the Argentine State Railways of the 34 railcars of 240 b.h.p. by that firm. These cars are divided over the metre-, standard-, and broad-gauge lines; the 29 metre-gauge vehicles have six different types of body, including an air-conditioned *de luxe* arrangement which can be turned into sleeping berths at night. The general details of construction of all the cars are similar to those of the Arpád cars of the Hungarian State Railways, from which most of the Ganz bogie cars in other countries have been developed. The success of these cars has led to proposals to increase the stock of diesels on the Argentine State Railways by 50, in order to replace steam trains on the Central Northern railway, and an endeavour is being made to obtain sanction for the expenditure of $5,000,000 paper for this purpose. The Buenos Ayres Pacific Railway is understood to be envisaging the introduction of main-line cars designed to run from Buenos Aires to Mendoza in about 13 hr., that is, at an average of approximately 50 m.p.h.

After much discussion and many proposals, the Uruguayan State Railways ordered several railcar-trains from the U.S.A., and some, at least, of these are to operate by agreement on the Central Uruguayan Railway. It is expected that a buffet service and other amenities for long-distance travel will be available. One of the Walker diesel-mechanical railcars was supplied to the Peruvian Corporation during 1936 for passenger service on lines near the Pacific coast, and a similar vehicle has been ordered for service on mountain routes. The first car is powered by the popular Gardner 6LW engine and has a Meadows four-speed gearbox; it embodies the usual Walker separate power bogie and tares 15·8 tons.

Walker railcars have been ordered also for the Sao Paulo Railway in Brazil and two 5 ft. 3 in. gauge cars for that line are under construction at Wigan. They are generally similar to the Peruvian vehicle, the chassis of which is shown in one of the illustrations accompanying this article, but Cotal electro-magnetic gearboxes are to be fitted. The Sao Paulo line also ordered in 1936 two streamlined four-car close-coupled non-articulated trains from Armstrong-Whitworth. They will be driven in both directions, and one of the end cars will contain an Armstrong-Sulzer engine fitted with a Büchi supercharger and having a continuous output of 600 b.h.p. Only first class accommodation will be available, and the normal seating capacity will be 128. On the neighbouring broad-gauge Central Railway of Brazil, five twin-car articulated Fiat trains are to be introduced on the Sao Paulo and Bello Horizonte routes. They are to have 80 seats and a buffet, and will be capable of either direction working.

Power unit and chassis of 100-b.h.p. Walker railcar for the Peruvian Corporation



420 b.h.p. 12-cylinder M.A.N. engine

PROGRESS

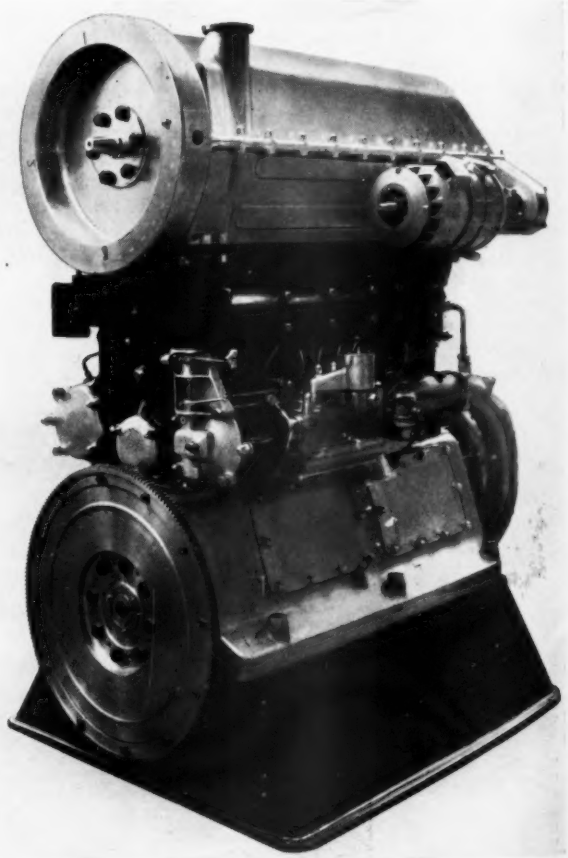
in Engine Construction

AN even greater variety of engines than ever was used for railway vehicles during 1936, but because of the extremely wide extension of diesel traction something approaching standardisation was possible in many applications. The new makes of engine used in railway work were only four in number, viz., Vomag, Bolinder, Hesselman, and Niigata, but many new sizes of established designs were introduced for the first time. Two-stroke engines, including some of extremely advanced design were used in increasing numbers, and supercharging asserted itself as a regular addition to the equipment rather than as an experimental fitting. Although the largest single-unit railway oil engine ever built was introduced during the year, the great preponderance of railcars over locomotives intensified the development of the smaller quick-running engines.

These railcar engines increased up to a limit of 500 b.h.p. unsupercharged, but the supercharged limit of 600 b.h.p. remained as in 1935. Actually, the 500 b.h.p. model, the 16-cylinder Renault, was built last year, but did not begin regular service until January, 1936. This applies also to another powerful vee type engine, the Saurer 12-cylinder 300 b.h.p. unit installed in the nine P.L.M. oil-electric cars operating on the Grenoble-Marseilles and associated lines. The M.A.N. single-crankshaft 420 b.h.p. design has been developed by the addition of a Büchi supercharger to give a continuous output of 560 b.h.p., thus corresponding with the previous double-crankshaft engines, of which only a few were built. The modifications made to the 410 b.h.p. Maybach engines as a result of experience on the Netherlands Railways have become standard for all new Maybach engines. They include balanced crankshafts, a different piston material, certain alterations to the fuel pumps and nozzles, and an increase of 10 mm. in the cylinder diameter.

Two new vee designs introduced during the year were the Fiat and Frichs 12-cylinder types, both with a continuous rating of 400 b.h.p. The Fiat design is used in the new triple-car streamlined trains of the Italian State Railways; its normal speed is 1,700 r.p.m. but the overload capacity is 550 b.h.p. at 1,800 r.p.m. It is used in conjunction with Fiat electric transmission. The Frichs engine is installed in one of the new Belgian triple-car oil-electric trains. Another application of vee engines was to the VT 42 class railcar of the Austrian Federal Railways, which work the semi-fast Vienna-Budapest service and the daily runs between the Austrian capital and Graz and Villach. Each of these cars is powered by two 8-cylinder vee Simmering engines of 210 b.h.p. running at 1,350 r.p.m.

Railcar engine practice as far as British and British-built vehicles were concerned was characterised mainly by the great strides made in the application of the Gardner engine, principally with the 6LW model rated at 96 to 102 b.h.p. In various sizes from 68 to 204 b.h.p. this make was set to work in nine countries during the year, and among the orders received were three for Argentine railways totalling 126 engines of the six-cylinder 102 b.h.p. size running at 1,700 r.p.m. Armstrong-Sulzer six-cylinder engines of 260 b.h.p. were completed for railcars ordered by the Central Argentine Railway; they are of the same general design as the four Sulzer engines of the



250 b.h.p. opposed-piston CLM.-Junkers engine

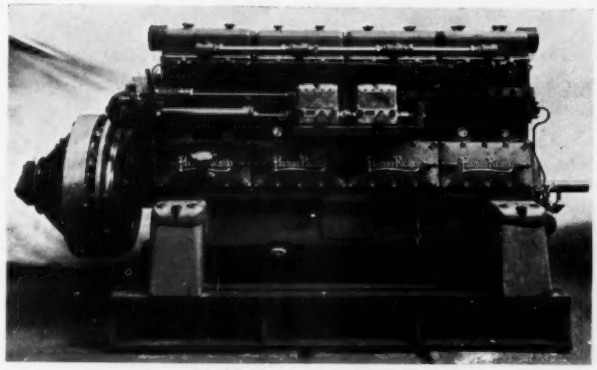
Buenos Aires Provincial Railways and have a brake m.e.p. of 80 lb. per sq. in. and a piston speed of 1,625 ft. per min. on the continuous rating. Another Sulzer design, developing 290 b.h.p. at 1,200 r.p.m., was set to work in January in the two Swiss Federal diesel-mechanical cars. From three-quarter to full load at 1,200 r.p.m. the fuel consumption is 0·41 lb. per b.h.p.hr., and at 650 r.p.m. and the same torque, 0·395 lb. The governor is set to give a certain number of speeds between 520 and 1,200 r.p.m.

Foreign railcar engines used during the year included all the well-tried standard designs such as M.A.N., Saurer, Berliet, Ganz, Deutz, Maybach, Mercedes; improved versions of existing standards, such as the 300 b.h.p. Renault; and engines new to railway work, such as the 90 b.h.p. Hesselman engine for the Jugoslav cars and the 115 b.h.p. Vomag engines on the Lübeck-Büchen Railway. The 300 b.h.p. Renault engine is of the 12-cylinder vee type, and was developed from the old standard 265 b.h.p. engine by modifications to the valves and other details. The 150 b.h.p. size, quite a new model, was evolved by erecting one six-cylinder bank from the 300 b.h.p. engine on an aluminium alloy crankcase of normal design.

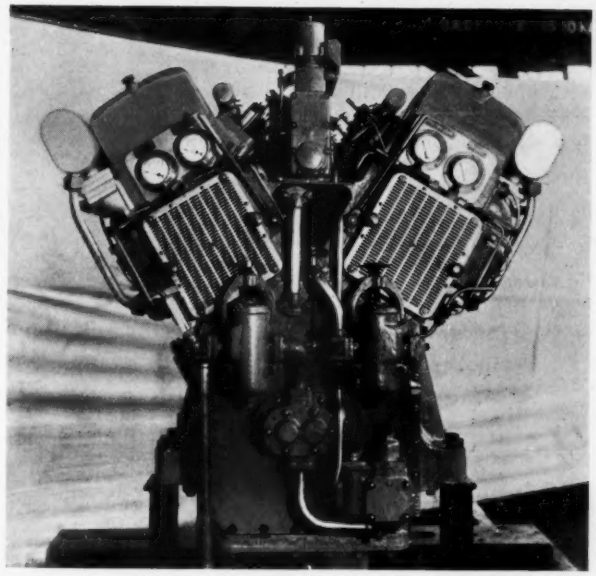
Locomotive applications were headed, in point of size, by the 10-cylinder two-stroke Busch-Sulzer engine used in the 154-ton Illinois Central freight transfer locomotive. The eight-cylinder 1,600 b.h.p. version of this engine, which has cylinders of 13½ in. by 16 in. and a rotational speed of 550 r.p.m., was fully described in the issues of this Supplement for January 26 and March 23, 1934. Entirely new designs for locomotive work were the Bolinder engine in Sweden and the 500 b.h.p. Niigata engine in Japan. In Britain the most notable applications were the 350 b.h.p. Armstrong-Sulzer and English Electric engines applied to the L.M.S.R. shunters; both were engines with which a good deal of actual running experience had been obtained, and this influenced the railway in the choice of motive power to be used. A new engine to England was the Frichs 275 b.h.p. unit running at 775 r.p.m., and installed by the Vulcan Foundry in its six-wheeled trial locomotive. The two Gleniffer engines of 160 b.h.p. at 900 r.p.m., installed in the Barclay locomotives for the Air Ministry, are also new to traction work. They have eight 6·0 in. by 7·0 in. cylinders, a piston speed of 1,050 ft. per min., and a brake m.e.p. of 89 lb. per sq. in. Yet another new design was the 180 b.h.p. Paxman-Ricardo engine which powers the Barclay locomotive for Imperial Chemical Industries. It is of the makers' 8RWT type and develops a continuous rated output of 180 b.h.p. at 1,100 r.p.m. in eight cylinders. It is one of the 60 Paxman engines varying from 20 to 180 b.h.p. which were delivered for locomotive work during the year.

Two-stroke engines of the Harland-B. & W. type were supplied to the Northern Counties Committee of the L.M.S.R. (330 b.h.p. eight-cylinder) for a shunting locomotive, and to the New South Wales Government Railways (360 b.h.p.) for railcar trains. The CLM-Junkers opposed-piston engine used hitherto only in the 85-110 b.h.p. sizes, was developed into 250 and 500 b.h.p. designs of most advanced characteristics, and the 250 b.h.p. model is one of the three types selected for the French "standard" railcars. In the U.S.A. the 12 and 16-cylinder Winton engines of 900 and 1,200 b.h.p. were used in a number of the new high-speed trains and locomotives.

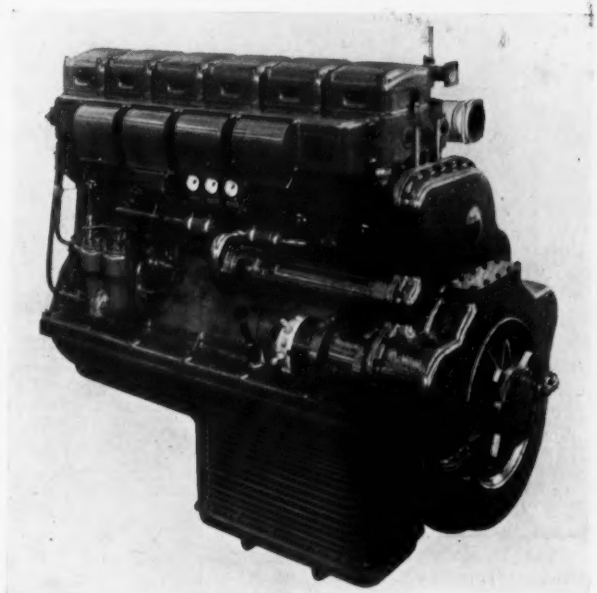
Supercharging with the Büchi turbo-blower apparatus made appreciable progress during the year, and has definitely come to stay. The first British supercharged engine is under construction for use in Brazil; it is of the Armstrong-Sulzer six-cylinder type and with the Büchi supercharger in operation will have a continuous output of 600 b.h.p.



180 *b.h.p. Paxman-Ricardo engine*



Twelve-cylinder Frichs engine for Belgian trains



290 *b.h.p. Sulzer railcar engine*

EUROPEAN DEVELOPMENT

Powers of 90 to 4,000 b.h.p. and maximum speeds of 30 to 127 m.p.h. form range of diesel activities during 1936

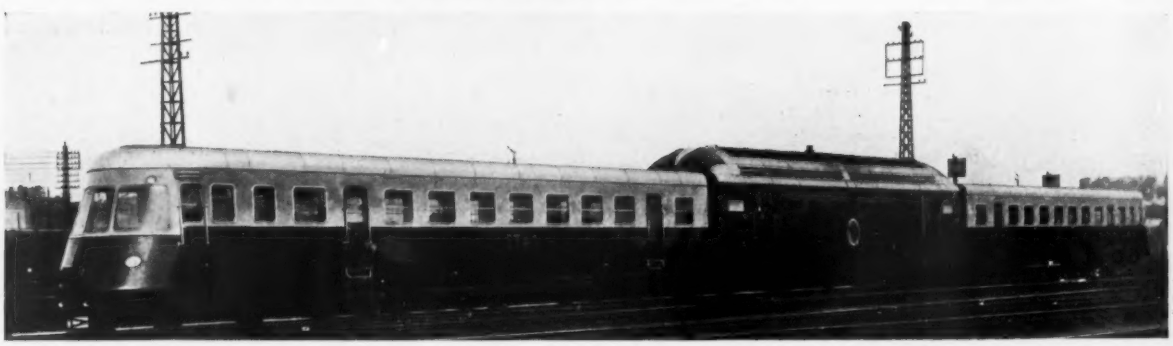
WITH the delivery of the nine Fiat 800 b.h.p. triple-car trains to the Italian State Railways at the end of the year, the total of streamlined diesel trains on the Continent was raised to exactly 100. In addition, there are 17 trains on order, apart from the six trains, only four of which were actually ordered, for the Spanish Norte. About 35 trains were put into service in the course of the year. The other outstanding feature of 1936 was the development of the railcar to the virtual elimination of the diesel locomotive, except for the 4,000 b.h.p. double-unit

Right: The Fliegende Kölner at Friedrichstrasse station, Berlin

Below: 1,000 b.h.p. Renault train, French State Railways

engined type have been ordered also, but they are being arranged for a top speed of only 75 m.p.h. in order to work fast interurban services in such districts as the Ruhr. Extension of railcar working on secondary lines has been made, and on these services the Reichsbahn estimates the traction charges as 0·35 RM. per train-km.

High-power single unit railcars have been set to work on the P.L.M. and Etat systems in France, but in the first case 600 b.h.p. twin-engined oil-electric vehicles are used for trailer haulage on the Alpine main line, whereas in the second example a single-engined diesel-mechanical car works fast and intensive services over level lines. Streamlined trains to the number of ten were acquired in 1936, two by



ordered by the Roumanian State Railways, three 600 b.h.p. shunters on the P.L.M., and a handful of light passenger locomotives in Denmark.

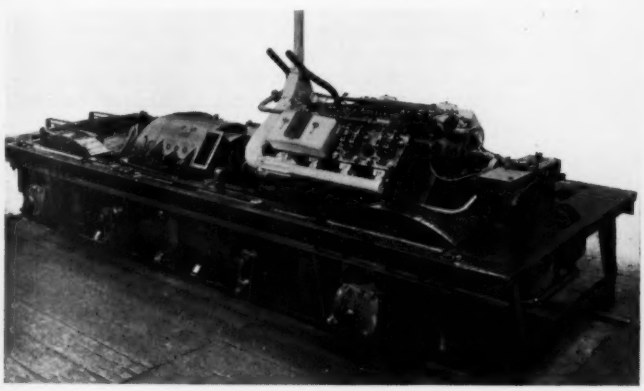
Although some of the 13 twin-car 820 b.h.p. trains went into traffic in 1935, the Munich, Breslau, and Cologne-Hamburg services did not begin until the present year, and the last of these trains, together with the four 1,200 b.h.p. supercharged triple-car trains belong to 1936. Three further triple-car trains for super speed work have been ordered by the Reichsbahn, but they are to have one supercharged M.A.N. engine of 1,300 b.h.p. which, along with its generator, is to be mounted on the underframe of the centre vehicle. Ten three-car rakes of the standard 820 b.h.p. Maybach-

Left: 280 b.h.p. Jugoslav car with Burmeister & Wain engine

the Etat and eight by the Nord. The 1,000 b.h.p. Renault gear-transmission rakes of the Etat are working the 70 m.p.h. Paris-Havre services, and the 820 b.h.p. triple-car sets of the Nord on the Paris-Lille and Lille-Havre routes at start-to-stop speeds up to 68·3 m.p.h. On the Est, single-unit railcars are operating the 67 m.p.h. non-stop schedule between Paris and Nancy. Progress also has been made in the introduction of the so-called "standard" railcars [see issue of this Supplement for June 12, 1936] with either Renault, Acenor (M.A.N.) or CLM-Junkers engines aggregating 600 b.h.p. as a maximum. SLM-Winterthur five-speed

oil-operated mechanical transmission is incorporated in all. Streamlined trains formed the only new construction in Belgium during 1936, eight triple-car rakes of 800 to 900 b.h.p. and with three different engine makes having been put into fast interurban services. Holland, having more or less solved the troubles associated with 35 of the 40 triple-car trains, began to run two and three of these rakes together in multiple-unit, and carried out 70 m.p.h. trials on the Groningen line preparatory to a new summer service in 1937. Eight 300 b.h.p. single-unit cars, six with two Stork-Ganz engines and two with Thomassen-Frichs engines, have been ordered. They are to have Mylius transmission with Vulcan-Sinclair fluid couplings.

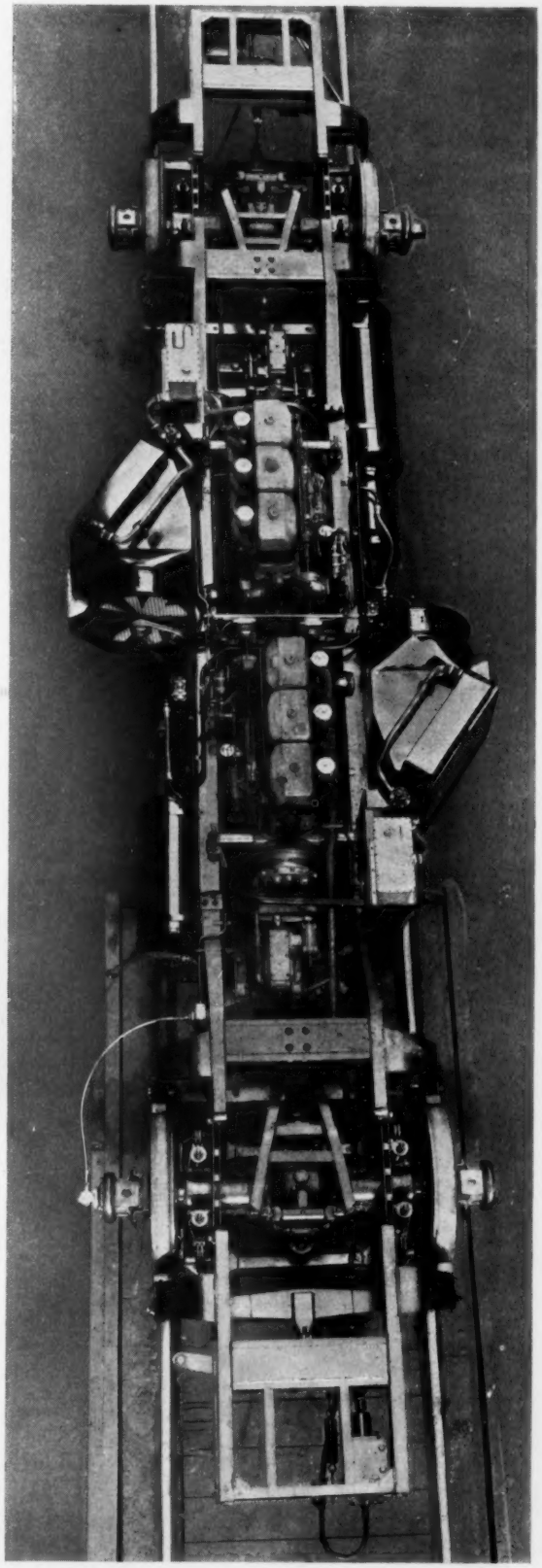
The international diesel car service between Budapest and Vienna, worked by the Ganz Arpád cars of the Hungarian State Railways, has been duplicated by another return trip beginning at Vienna and worked by the 420 b.h.p. oil-electric cars of the Austrian Federal Railways which, on the east-bound trip, haul a through carriage running between the Hook of Holland and Budapest. These railcars also operate, in conjunction with the Austro-Daimler petrol cars, the Vienna to Graz and Klagenfurt runs, the latter of which has now been extended to Villach. Trains of three or four trailers hauled by a powerful diesel railcar (300 to 400 b.h.p.) continue to be popular in Czechoslovakia, in which country the State Railways have over 90 diesel cars varying from 100 to 400 b.h.p. Three 90 b.h.p. four-wheeled and three 280 b.h.p. bogie cars were introduced by the Jugoslavian State Railways on their standard gauge lines, and this initial application was, apparently, so satisfactory that further cars are to be built for service on the narrow-gauge system.



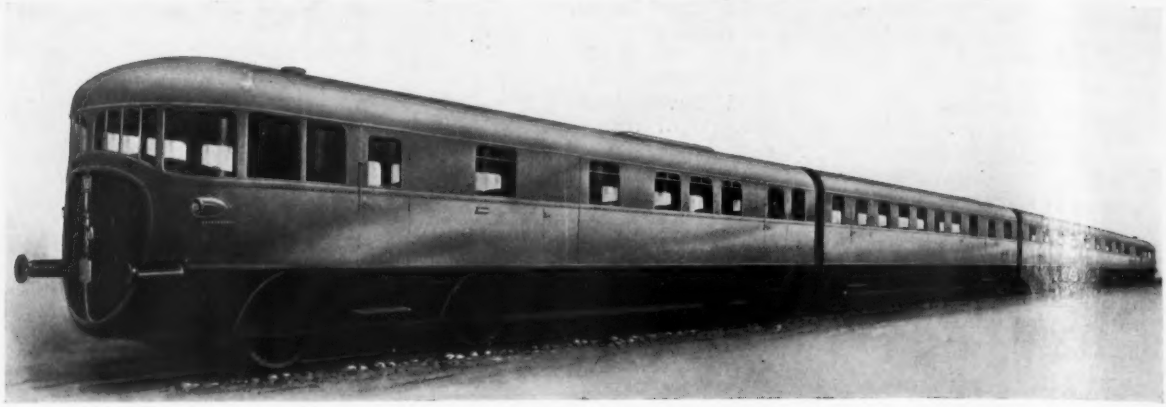
Bogie of Austrian main-line railcar, carrying 210 b.h.p. Simmering engine

A number of small and medium power locomotives and railcars have been set to work in Denmark and Sweden, and also ten big 550 b.h.p. railcars for heavy trailer haulage on the Danish State Railways. The daily mileage of the four *Lyntog* trains has also been increased to a total of 1,500. An interesting development on the Norwegian State Railways was the decision to build a two-car diesel train to seat nearly 150 passengers for service on the line from Oslo to Kornsjo, on the Swedish frontier. From January onwards the two 290 b.h.p. cars of the Swiss Federal Railways have been maintaining services in the west of Switzerland totalling 335 miles a day, each car working alternately.

In Roumania over 70 cars of 120 to 150 b.h.p., with Ganz and M.A.N. engines and Ganz or Mylius mechanical transmission, have been placed in service during the last two years and operate over 1,750 miles of line. On the secondary lines over which these cars work 40 per cent. of the steam trains have been replaced by railcars and the train-mileage increased by 36 per cent. at an operating cost one-third that of steam.



Chassis to 230 b.h.p. railcar with two Vomag engines and two sets of Mylius transmission, Lubeck-Büchen Railway



800 b.h.p. Fiat diesel-mechanical train

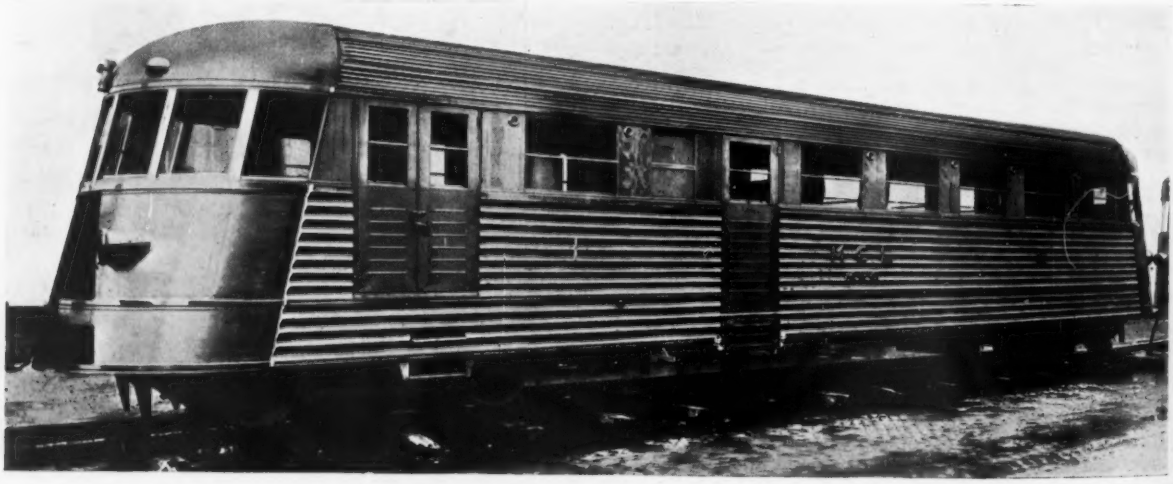
Rapid advance of Italian diesels

Main, secondary and rack-railway cars

OF all countries in Europe Italy probably has made the greatest advance in the use of oil-engined railcars during the past 12 months. Not only have the last of the 100 Fiat Littorina railcars ordered in 1935 been put into service, but 25 Littorina buffet cars geared for a top speed of 130 km.p.h. (81 m.p.h.) were rushed through and began fast services in the Milan-Bologna-Venice-Bolzano area during the summer, and accelerated services over the Sicilian standard-gauge lines a little later. In addition, the nine 800 b.h.p. Fiat three-car streamlined trains commenced their trial trips in November, and at the end of the year an order for some 260 b.h.p. diesel-mechanical railcars with a large luggage capacity was placed with Breda.

Nor have the Italian private lines been idle. The Strade Ferrate del Mediterraneo, which introduced diesel traction on its 950 mm.-gauge lines as long ago as 1924, put into service some stainless steel oil-electric railcars and increased its stock of oil-electric rack-and-adhesion railcars. The Southern Sardinia, Suzzara, and Circumetnea Railways also acquired diesel-mechanical railcars of 160 to 230 b.h.p. and with top speeds of from 40 to 56 m.p.h. On the State railways the diesel cars, of 160, 230, 260, and 290 b.h.p., have reduced the operating cost considerably while giving, on the secondary lines, a service of increased density at average speeds 30 per cent. faster. The operating cost including maintenance is about 2·8 lire per km. In no case is a trailer hauled, but despite this no drawbacks have been found in districts where heavier traffic is carried on certain days of the week. Where possible, several cars are shedded together and for every seven or eight cars in service there is one spare, which can be used on days of heavy traffic. Only on the Rocchetta-Spinazzola line is the complete passenger and goods traffic worked by railcars, but further light freight and parcels cars are being introduced. Diesel railcar services are now in operation on about 1,000 route miles of the State system.

The Fiat buffet cars are now operating in the north of Italy on start-to-stop schedules as high as 69 m.p.h. When the three-car trains go into regular service they will take over some of these buffet car trips where additional accommodation is required, such as the 62·2 m.p.h. non-stop run over the 166 miles between Milan and Venice. The three-car rakes (November 27 issue of this Supplement) carry 36 first class and 42 second class passengers compared with the 17 and 23 of the buffet cars (October 30 issue of this Supplement).



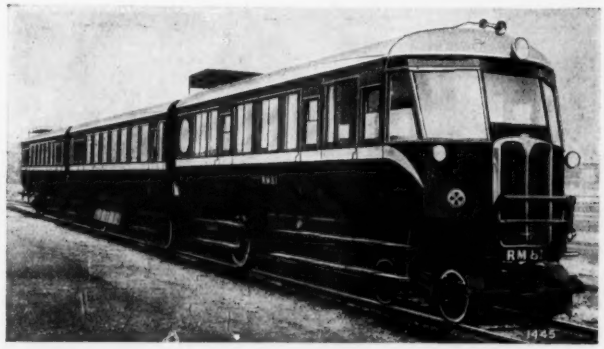
260 b.h.p. Saurer-engined stainless steel oil-electric railcar for the Strade Ferrate del Mediterraneo

HEALTHY SIGNS
in Africa, Asia, and Australasia
RAILCAR INVASION OF BRANCH AND SUBURBAN LINES

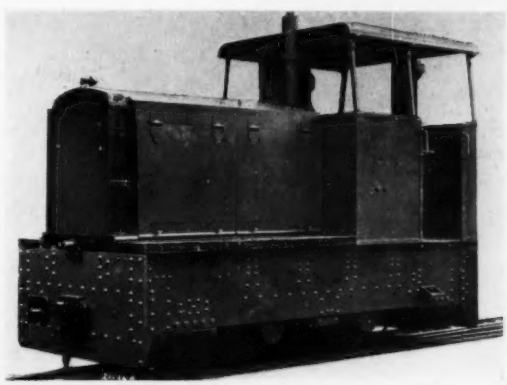
IN the countries covered by this article approximately 23 diesel locomotives, 32 railcars, and 2 trains were put into service during 1936, and 5 locomotives, 80 cars, and 3 trains were ordered, both sets of totals being distinct advances on those for any previous year. In addition, progress was made with the four 360 b.h.p. railcar trains ordered by the New South Wales Government Railways in 1935 but not yet delivered.

Experience on the Egyptian State Railways has shown the operation of railcars to be satisfactory, and 20 further Ganz cars, close-coupled into 10 rakes of two, have been ordered. At the moment 14 return trips a day are made between Cairo and Helwan by two of the 1935 cars, but they have first class accommodation only. When the doubling of the Helwan line has been carried out it is intended to work all the passenger traffic by the diesel cars, with a 10-min. service at peak hours. On the neighbouring Sudan Railways two 50-ton 350 b.h.p. English Electric shunters were put into service, and on the Eritrean Railways three or four 130 b.h.p. Fiat cars were introduced. In the French African colonies and protectorates orders were placed for 25 railcars and four locomotives, and on the Tunisian Railways 10 Renault cars were set to work and have succeeded in regaining much traffic from the roads. Other activities in Africa included three English Electric locomotives and eight Hibberd narrow-gauge locomotives for work in the gold fields, and the inauguration of the first diesel railcar service in Rhodesia.

Asiatic deliveries extended from Turkey to Japan, four 150 b.h.p. M.A.N.-engined cars being acquired by the Turkish State Railways and three 500 b.h.p. oil-electric freight locomotives by the Japanese Government Railways. Light railcars and one or two trains were introduced on the Japanese private lines and the Manchukuo State Railways; six 280 b.h.p. Saurer-engined railcars began work on the Yunnan Railway; and the Indo-Chinese State Railways ordered six 250 b.h.p. Renault cars for fast services up to 70 miles in length. After experience with locomotives, the Ceylon Government Railways ordered three four-car trains of 360 b.h.p. for suburban service, and the Bombay, Baroda & Central India Railway purchased a 350 b.h.p. Armstrong-Whitworth oil-electric shunter. After converting a light petrol car to diesel, the South Indian Railway sanctioned the purchase of eight broad-gauge and four narrow-gauge oil-engined railcars. On the G.I.P.R. an intensified and accelerated Armstrong-Saurer diesel railcar service on the Pulgaon—Arvi line has virtually eliminated bus competition.



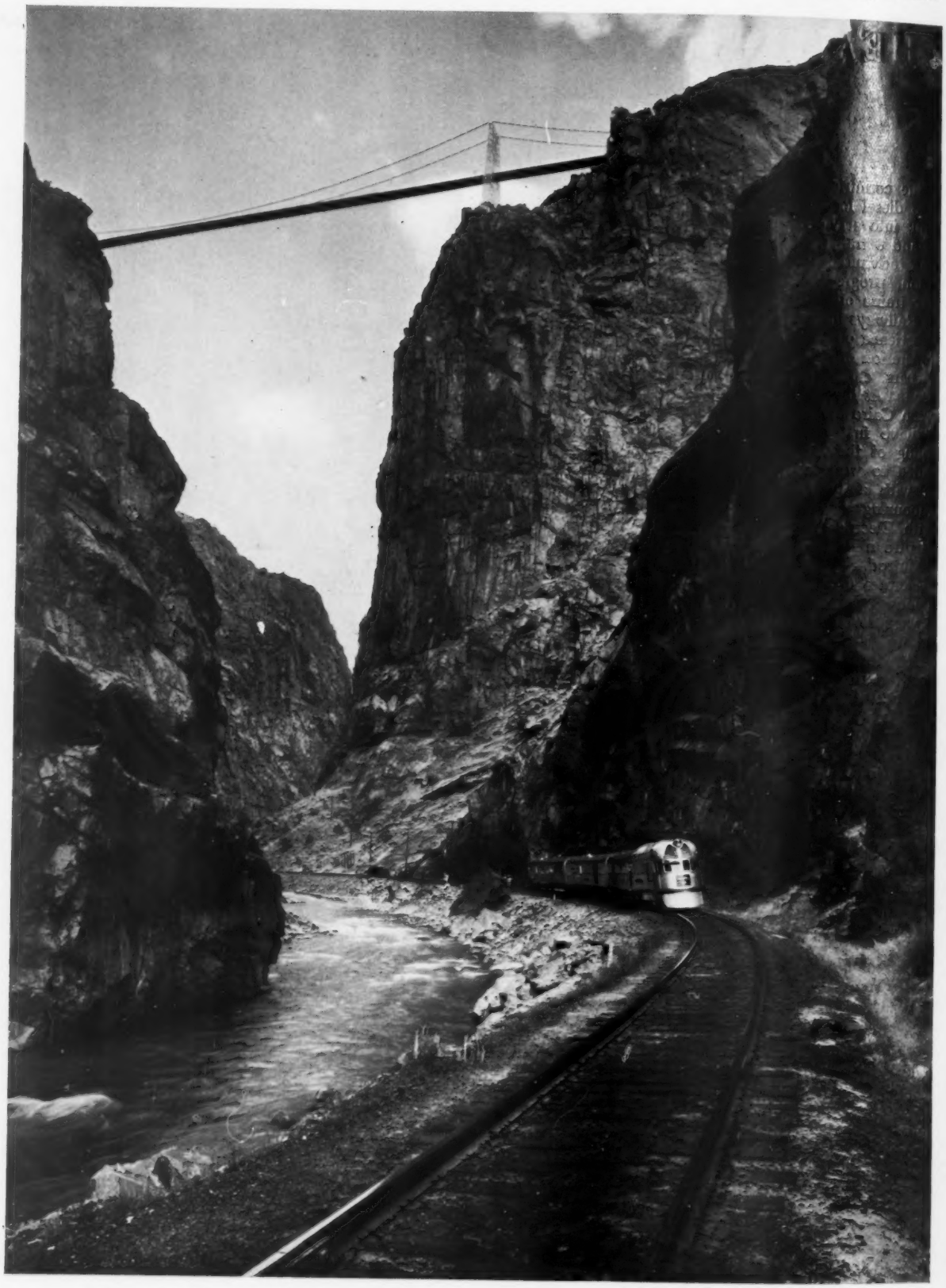
Above: 102 b.h.p. Gardner-engined railcar train, Queensland Government Railways



Left: 65 b.h.p. Paxman-engined Hibberd locomotive for West Africa

Bottom left: Fiat oil-engined railcar on the 950-mm. gauge Eritrean Railways

Two Gardner-engined railcar trains, each of 102 b.h.p. and with VSG hydraulic transmission were set to work in Queensland in 1936, and, after encouraging experience with trial units, the South Australian Railways ordered nine British engine-transmission sets for installation in further cars. Orders were placed by the Western Australian Railways for one complete railcar and five engine-transmission-chassis equipments, all of the Armstrong-Saurer oil-electric type. The first diesel car in New Zealand, a 95 b.h.p. Leyland hydraulic transmission unit, is working over the Otira tunnel route in South Island, and a double-engine 260 b.h.p. car with Leyland engines is being built. If this car is successful it is intended to widen considerably the use of the larger type of vehicle in both North and South Islands.



THE ADVANCE DENVER ZEPHYR PASSING THROUGH THE ROYAL GORGE

(See article on opposite page)

Diesel Traction in the U.S.A.

A REVIEW OF PROGRESS IN 1936

By
RODGER L. SIMONS

THE status of diesel traction on American railways during the past twelve-month has been a matter of what military strategists call "consolidating present gains," rather than making sensational new conquests. The two major pioneers in this field, the Union Pacific and Burlington Railroads, have added extensively to their fleets and a limited volume of new stock has been put on the rails by a few other roads. But there has been nothing as radically new and novel as the original Union Pacific train or the Zephyr of three years ago.

Encouraged by the public favour and by the operating economies which have attended their earlier streamliners, *City of Salina* and *City of Portland* (of three and seven cars respectively), the Union Pacific has gone on with a fleet of eleven and twelve-car super-flyers. The first two, built by the Pullman-Standard Car Manufacturing Company, are the *City of Los Angeles* and the *City of San Francisco*, each of which entered service during the early summer and each made up of nine articulated body units and a two-unit locomotive. They are designed from the standpoints of comfort and safety to make the practically twins and their major features of design and appointments follow the precedent of the earlier City class trains. This includes air-conditioning throughout, an alert yet soothing modern decorative scheme, dining and lounge facilities, and both day coach and sleeping car facilities. Among the latter may be mentioned a seemingly trivial yet not unimportant feature, two sections six inches longer than standard for the comfort of passengers whose height exceeds "standard."

Next came twin twelve-car trains each named *City of Denver*, for service on the Union Pacific's route from Chicago to the Rocky Mountain metropolis whose turbulent name they bear. Also built by Pullman-Standard, the trains resemble *City of San Francisco* in having the same style of nose and the two-piece power section. The latter is followed by ten revenue-earning units, including

City of Denver diesel-electric train of the Union Pacific Railroad

pull from Chicago to the cities named in less than 40 hours, thus saving a business day over the former time on this run, and forming a corresponding service to that of the more northerly run of the *City of Portland*.

Each of the two trains is built up of aluminium alloy throughout, with the obvious exception of cast steel bogies, the power plant and a few related or incidental parts. *City of Los Angeles* has at her command 2,100 b.h.p. through a diesel-electric plant built by the Electro-Motive Corporation, the forward engine developing 1,200 b.h.p. and the one just aft adding another 900 b.h.p. *City of San Francisco* has 1,200 b.h.p. in each of her two locomotive units. In addition, a spare 2,400 b.h.p. two-part power vehicle has been built for the U.P. by the Electro-Motive Corporation.

Astern of the locomotive sections these two trains are baggage, mail, tavern, dining, sleeping and observation cars, totalling 272 in passenger capacity.

With her two 1,200 b.h.p. diesel-electric units the train makes the run of 1,048 miles from Chicago to Denver, with eight station stops, in a total elapsed time of 16 hours, an average speed of 65·5 m.p.h. The main visual differences between the Denver trains and their earlier kin are that the coaches of the new twins are only partially articulated and have straight sides, as in the more conventional practice, rather than side walls which taper out at the bottom.

Special interest resides in the brake control equipment by which it is impossible for the driver to follow the practice common to his craft of sometimes pushing the speed above the legal or prescribed maximum. Thus in addition to the usual cab signals and whistles, there is

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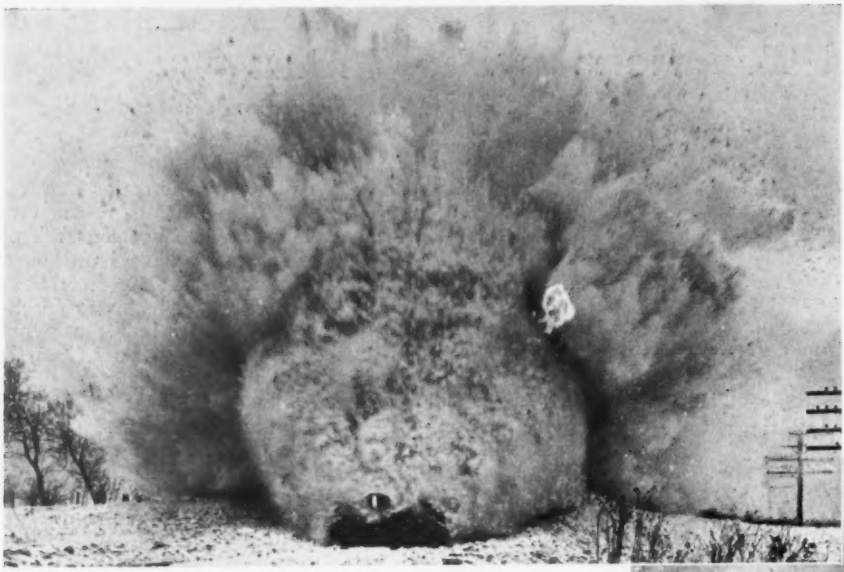

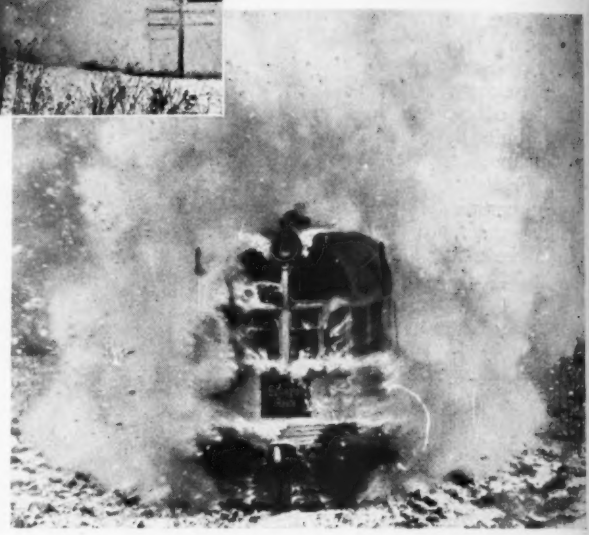

Two views of the stainless steel Burlington Zephyr encountering a small snowdrift at 80 m.p.h.

a special speed whistle of high and penetrating pitch which sounds when the train exceeds the stated limit. When this figure is transcended, the engineer has eight seconds in which to cut her down and stop the whistle. If he doesn't, the brake application is automatically engaged.

Following their *Mark Twain* Zephyr of a year ago, the middle-western American roads known collectively as the Burlington Line have memorialised another historic American figure in the *Sam Houston* Zephyr. This train plies between the city which shares its name and the north Texas centres of Dallas and Fort Worth, a round trip daily. With her 660 b.h.p. two-stroke Winton oil-electric power plant she polishes off the 250 miles from Houston to Dallas in 250 minutes.

A three-car articulated train of Shotwelded stainless steel, the *Sam Houston* is actually one of the trains which ran on the Chicago-Twin Cities service, but the interior has been remodelled to provide a special quarter for the accommodation of sixteen negro passengers. Situated in the forward or power unit and abaft the baggage and express compartment, it none the less shares the air-conditioning facilities which the white passengers enjoy.

Four newer and longer Zephyrs bring the Burlington's total investment in this type of equipment to £1,000,000. The original three-car Twin Zephyrs on the run from Chicago to the Twin Cities have been replaced by two seven-car trains of similar stature. They each carry 200 passengers, as against the eighty who crowded into each of the former Twins. Designed for daylight service, they have dining car, cocktail lounge, and observation car.

Then there are the two Denver Zephyrs built for the 1,034-mile overnight run from Chicago to Denver. The first two units of each carry the power and transmission equipment, followed by a bewildering array of dining, lounging, reclining and sleeping facilities. A number of improvements have been introduced for the satisfaction of patrons. Included are 110-volt a.c. electric outlets in all wash rooms, bedrooms, drawing rooms and compartments for the service of standard-voltage electric razors, pads, curling irons and other accessories; telephone service between cocktail lounge, dining car and parlour-observation coach; private radios; and individual localised air-conditioning controls in all drawing rooms, bedrooms and compartments. There is even an " air curtain " to eliminate kitchen odours.

Contracting the diesel-streamline virus from its neighbours, the Illinois Central blossomed out early in the spring with its five-car *Green Diamond*. Competing with the Baltimore and Ohio's earlier Abraham Lincoln diesel-electric speedster, the new Illinois Central train is assigned to the Chicago—St. Louis run.

Like the U.P.'s *City of San Francisco*, which, although shorter, it resembles, the *Green Diamond* was built in the Chicago shops of Pullman-Standard and is framed with Cor-Ten steel and sheathed in aluminium. With her 1,200 b.h.p. oil-electric power plant she does her daily stint of 588 miles on the round trip between Chicago and St. Louis at an average speed close to 60 m.p.h.

Since the putting in service of *The Rebel* trains a year and a half ago the Gulf, Mobile and Northern Railroad has added no diesel trains to its lines, although its entire passenger traffic is now operated by diesel or petrol railcars and trains. At the end of October the management of this road expressed itself as " about ready " to place an order for an additional diesel train.

In the single-unit field, the Seaboard Air Line, running from New York City south along the Atlantic coast, has come out with a diesel railcar bearing the Electro-Motive Company's maker's plate. In addition to a 600 b.h.p. Winton engine the car includes mail and baggage facilities. The year's quota of diesel-electric shunting locomotives includes two 1,800 b.h.p. and one 2,000 b.h.p. giants for the Chicago yards of the Illinois Central.

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